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New Asiatic And African Caecilians With Redescriptions Of Certain Other Species

By

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ABSTRACT

This paper deals with caecilians of southeastern Asia and the African islands of São Thomé and Rolas in the Gulf of Guinea. Four species are redescribed: *Ichthyophis glutinosus* (Linnaeus), *Ichthyophis hypocyaneus* (Van Hasselt), *Ichthyophis weberi* Taylor, and *Schistometopum brevirostris* (Peters). A neotype is designated for *I. weberi*. The following are described as new: *Ichthyophis atricollaris* (Borneo), *I. elongatus* (Sumatra), *I. biangularis* (Borneo), *I. pesudangularis* (Ceylon), *I. asplenius*, Borneo, *I. forcarti* (Ceylon), *I. orthoplicatus* (Ceylon), *I. billitonensis* (Billiton); and *Schistometopum ephelē* São Thomé.

Ichthyophis hypocyaneus and *Schistometopum brevirostris* are rehabilitated names removed from the synonymy of *Ichthyophis glutinosus* and *Schistometopum thomeuse* respectively.

INTRODUCTION

In the preparation of a taxonomic treatment of the Gymnophiona of the world, I have been reviewing the caecilians in many of the museums of the world and collecting in those areas where members of this order are to be found. As was to be expected certain forms, presumably undescribed, have been encountered and a part of them are herein described.

A neotype is designated for *Ichthyophis weberi* whose type was destroyed in the Bureau of Science in Manila in World War II.

I have had the fortune to study the type of *Caecilia hypocyanea* Van Hasselt preserved in the Leiden Museum. This is, I believe, a recognizable species and is removed from the synonymy of *Ichthyophis glutinosus*, a species that has been a most remarkable catch-all during taxonomic history. Another species, described as *Siphonops brevirostris* Peters and later placed in the

synonymy of *Schistometopum thomense*, is resurrected and designated *Schistometopum brevirostris*. Unfortunately however the type of *brevirostris* was not available for examination when I was last in Berlin.

A list of forms treated in this paper are:

Ichthyophis glutinosus (Linnaeus)
Ichthyophis hypocyanus Van Hasselt
Ichthyophis atricollaris sp. nov.
Ichthyophis elongatus sp. nov.
Ichthyophis biangularis sp. nov.
Ichthyophis pseudangularis sp. nov.
Ichthyophis asplenius sp. nov.
Ichthyophis forcarti sp. nov.
Ichthyophis weberi Taylor
Ichthyophis orthoplicatus sp. nov.
Ichthyophis billitonensis sp. nov.
Schistometopum ephele sp. nov.
Schistometopum brevirostris Peters

ACKNOWLEDGMENTS

In my caecilian studies of the past three years I have placed myself under obligation to many persons and institutions. This very considerable list will appear in the general work which I have in preparation. Those persons and institutions that have helped with this preliminary study or who have provided specimens are mentioned here.

I desire to acknowledge my deep obligation for information or for many kindnesses while visiting their museums; and my grateful thanks for the loan of specimens and the privilege of describing new forms:

To Dr. Hjalmar Rehndahl and Miss Greta Vestergren of the Royal Natural History Museum, Stockholm, Sweden, for pertinent information on the type of *Caecilia glutinosa* (Linnaeus).

To Dr. L. D. Brongersma, Director of the Leiden Museum, who loaned the type of *Caecilia hypocyanus* Van Hasselt, and permitted me to describe the Bornean *Ichthyophis atricollaris* and *Ichthyophis asplenius* from the Leiden Museum collections, and who furnished much helpful information regarding the work of Kuhl and Van Hasselt in Java, and the publications on their collections; also to Dr. H. Boschma and Dr. M. Boeseman of Leiden for many courtesies at the Museum.

To Dr. George S. Myers, Division of Systematic Biology, Stanford University, and Dr. Alan E. Leviton, Associate Curator of Zoological collections for loan of material from the Stanford collections, especially the only known specimens of *Ichthyophis weberi* (practically topotypes), one of which has been named a neotype of the species.

To Dr. Lothar Forcart of the Museum of Natural History, Basel, Switzer-

land for the loan of significant specimens with the privilege of describing *Ichthyophis forcarti*, and *Ichthyophis pseudangularis*.

To Dr. Josef Eiselt of the Natural History Museum in Vienna for loans and the privilege of describing *Ichthyophis elongatus*; and also for other specimens.

To Miss Alice G. C. Grandison for the privilege of describing *Ichthyophis biangularis*; also for the loan of a number of other significant specimens.

To Mr. Hellenius of the Amsterdam Zoological Museum for the loan of specimens, one of which, *Ichthyophis billitonensis*, is described as new.

To Dr. Enrico Tortonesi, Director of the Civic Museum of Genoa for the loan of significant specimens, one of which has been named the type of a new species, *Schistometopum ephele*; and one a specimen of *S. brevirostris* Peters which convinces me that Peters' species merits specific designation.

To the Director of the Zoological Survey of India and Miss Mira B. Kirpalani for the loan of specimens, one of which is named the type of *Ichthyophis orthoplicatus*.

Ichthyophis glutinosus (Linnaeus)

Figs. 1, 2, 3.

? *Serpens caecilia ceylonica* Seba, Locupletissimi rerum naturalium thesauri accurata descriptio, et iconibus artificiosissimis expressio, per universam physices historiam, vol. 2, 1735, p. 26, pl. xxv, fig. 2 (Ceylon).

Caecilia glutinosa Linnaeus, Museum S.R.M. Adolphi Friderici Regis Svecorum—in quo Animalia rariora imprimis et exoticæ: Quadrupedia Aves, Amphibia, Pisces, Insecta, Vermes describuntur et determinantur labine et svetice cum Iconibus jussu Reg. a. Car, Linnaeo, 1754, p. 19 ("In Indiis"); Caroli Linnaei Systema Naturae per Regna tria Naturae secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locus, Ed. 10, reformata, 1758, vol. 1, p. 229 (type-locality "In Indiis"); Andersson, Bihang Till. K. Svenska Vet. Akad. Handlingar, Bd. 24, Afd. 4, No. 6, 1899, p. 6 (type of *glutinosus*).

Ichthyophis glutinosus Taylor, Univ. Kansas Sci. Bull., vol. 40, Apr. 20, 1960, pp. 38-39.

The name *Ichthyophis glutinosus** has been used in more than a hundred articles applying to perhaps ten or more different species. Some of these may actually deal wholly or in part with *glutinosus* but most of them do not. To make an authoritative assignment of each, it would be necessary to examine the material studied or referred to by each author.

In a paper dealing with Asiatic caecilians published in the University of Kansas Science Bulletin (Vol. 40, April. 20, 1960, pp. 37-120), I pointed out that the Linnean description of *Caecilia glutinosa* was somewhat inadequate to identify certainly this species among the several forms that exist in Asia.

* See Bourret, Les Batraciens de l'Indochine (l'Institut Oceanographique de l'Indochine) 1942, p. 136, for a listing of articles.

Thus Linnaeus states that he is unable to observe tentacles ("Cirrhos nullo observare potui"); teeth are not mentioned as occurring on the lower jaw; no mention is made of the presence of scales; characteristics of the nuchal collars are not mentioned and the locality given "Habitat in Indiis" might be anywhere in India, Ceylon, southeastern Asia or Islands of the Indo-Australian Archipelago.

Seemingly the type was not seen by subsequent writers on caecilians until studied by Andersson when he published his "Catalogue of Linnean type specimens of snakes" in 1899.* Andersson gives the length as 400 mm. (Linnaeus had said "Longitudo pedem superat"), and gives 355 as his count of transverse folds, Linnaeus' count having been 350.

In 1959 I appealed to Dr. Hjalmar Rendahl of the Royal Natural History Museum, Stockholm, Sweden for further data on the type specimen. The matter was placed in the hands of Miss Greta Vestergren. She has had the kindness to forward certain data on the type which I present here:

"I must call your attention to the fact, that the specimen in question is not in exceedingly good condition. The snout is broken, most of the teeth in the upper jaw are lost, and moreover the specimen seems to have been dried partially, on account of which the fold-limits on the anterior part of the ventral surface are rather difficult to distinguish."

"Measurements in mm.:

"Total length 394; length from front of vent to tip of tail, 5.4; length of head from tip of snout to first groove, 14; width of head at first groove, 12.2; width of body at near middle, 17.2; distance between eye and tentacle, 2 mm. Tentacle to nostril? (snout broken); level of eyes to tip of snout, 6.2; diameter of eye, 0.7; distance between eyes, 7.5.

"Scales begin in the first and second folds, each fold having two scalarows. The third fold has three scalarows, the fourth fold four rows; while throughout almost all of the remaining folds of the body there are six scalarows." Thus the scalarows total something more than 2000.

"The count of the transverse folds on the middle of the right side of dorsum (including tail) is 359; on the middle of the left side, 367; lower on sides, 355-365; count on venter 357 (?).**

"Accurate count of the teeth was difficult to obtain and those that follow must be regarded as approximations: maxillary-premaxillary, total, 18-18; vomeropalatine, 16-17; dentary teeth, 20-17, spenial teeth, 11-12.

"The details of the color-markings are as follows:

A yellowish lateral stripe 4.5 mm. wide reaching to the tip of the tail; it does not connect with any yellowish spot at vent; the stripe is broken on the

* Bihang Till K. Svenska Vet.-Akad. Handlingar Bant. 23, Afd. 4, No. 6, 1899, p. 6.

** These differences in counts are due to splitting of the folds. The counts range from 355 to 367 at various points.

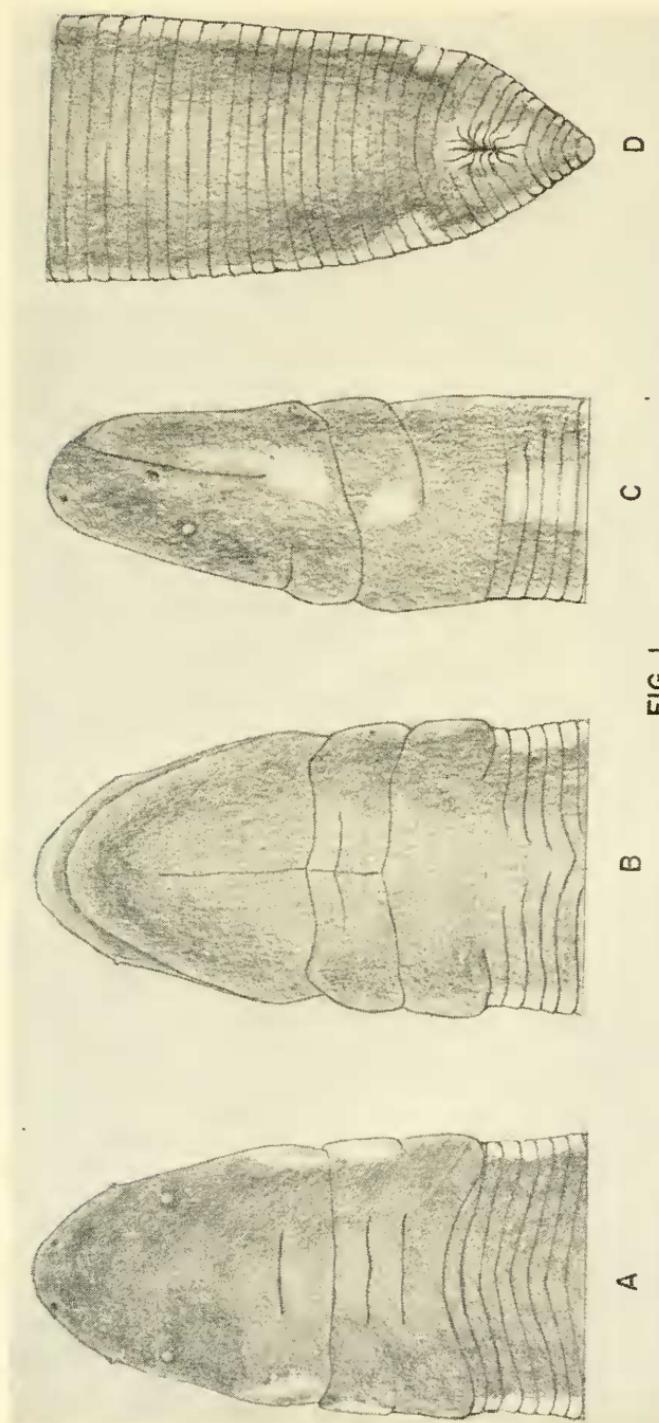


FIG. 1

FIG. 1 *Ichthyophis glutinosus* (Linnæus). Basel Museum No. 1, Ceylon. A, dorsal view of head; B, ventral view of head; C, lateral view of head; D, terminus of body and subcaudal region. Width of head at first nuchal groove, 12.5 mm.

neck by dark color, but narrowed, reaches beyond this, at least to the tentacle. At the jaw-angle the yellow divides, one narrow branch passing along the edge of the lower jaw to the tip. The stripe widens somewhat on the neck. The color of the entire ventral surface is a lighter brown than the brown of the dorsum. The eye is distinct on the left side (scarcely so on the right), and surrounded by a light ring. There is no light anal spot. It is impossible to say whether or not light spots were present on tentacles and nostrils. No glands are evident at the sides of vent. The sex is indeterminable.

“Concerning the folds it might be added that they are complete under the abdomen at least on the hinder two thirds. As I mentioned previously, the fold-limits are rather indistinct on the mid-ventral region of the anterior part of the body. The folds form a sharp angle on the abdomen pointing backwards except for an area in front of vent. On the anteriormost part of the back they may form an angle.”

Diagnosis: A relatively short thick-bodied species, the body width in total length 19 to 21 times in adults; transverse primary and secondary body folds approximately from 348 to 369 ventral count, 354 to 382 dorsal count (rarely counts may be higher or lower). Color in life bluish gray to ultramarine often turning brown in preservatives. Eyes represented by grayish-white areas without visible details of lens or pupil; scalarows six or seven in each fold throughout most of the body, averaging a total of 2000 or more scalarows. Splenial teeth 11-11 to 14-14.

Description of species (from Musée d'Histoire Naturelle Bale (Suisse) No. 1, Ceylon, collected and studied by Paul and Fritz Sarasin): Body somewhat flattened; head rather small, the eyes small, evidenced only by a slightly elevated gray area (no details of lens or pupil discernible); tentacle near edge of lip, separated from eye by a distance of 2 mm., from nostril by 3.8 mm.; distance between eyes, 7 mm.; distance from level of eyes to tip of snout, 6.1 mm.; eye to nostril, 5 mm.; eye to mouth-angle 4 mm.; two nuchal collars, the first limited by the first groove going straight across throat and curving back a little and passing completely around occiput; second groove curving strongly forward on throat and up on sides of head to about level of jaw; third groove limiting second collar moderately distinct around neck; from tip of snout to first groove (lateral measurement), 13 mm. (median ventral, 11 mm.), (dorsal, 13 mm.); to second groove (lateral), 17 mm.; (ventral, 14 mm.); to third groove (lateral), 20.3, (ventral, 21 mm.); (dorsal, 18 mm.). The first collar has a faint median transverse dorsal groove; the second collar has two posterior folds, first reaching down to mouth level, the second reaching venter.

Total transverse folds following the two collars, 342 (dorsal count), 328 (ventral count); nine folds confined to tail. The grooves and folds on

anteriormost dorsal part of body curve forward mesially and sometimes form a slight angle on dorsal part of body; but ventrally in anterior half of body the grooves are dim or interrupted, although the folds can be seen to cross completely and form a backward-directed angle; posteriorly the grooves are clearly seen and tend to go straight across venter for some distance in front of vent; two slight elevations present on sides of vent suggesting glands.

One to four scalarows in the folds of the first three centimeters of body; beyond this, folds with five to seven (sometimes eight) scalarows, reaching a total of approximately 2000 scalarows. Anteriorly scales very small, transversely widened; posteriorly they are larger, more nearly cycloid, but in any fold the scales of one row may vary in size and overlap laterally, or in places they may not even touch.

Dentition: Maxillary-premaxillary, 20-21; vomeropalatine, 20-20; dentary, 18-19; splenial, 12-12. The teeth relatively small for the size of the species, the anterior dentaries a trifle larger than the premaxillaries; tongue broad, with some longitudinal plicae, covering splenial teeth completely, the edges free; choanae somewhat elongate, oval, the greatest width of one, in distance between them, approximately three times.

Color: Above bluish-gray uniform on all dorsal surfaces; venter slightly lighter but almost same shade; a yellow (now faded) lateral stripe about 2.8 to 3.2 mm. wide extending posteriorly to or almost to extreme tip of tail but not joining a dull cream spot on vent; anteriorly on collars the stripe is interrupted completely, but anterior to collar it widens and bifurcates, one upper part reaching a short distance along the upper jaw, and lower part passes on lower jaw for a distance; ill-defined light spots on tentacle and nostril.

Measurements in mm.: Total length, 303; tail, 5.7; width of head at eye, 9; width of head at first groove, 12.5; length of head to first groove (lateral measurement), 13; width of body, 16; width in length, 19 times.

Variation: The specimen described agrees in most characters with the type. The change from the ultramarine or bluish gray color to the brown color of the type appears in some recently collected specimens. It is conditioned by the character of the preserving fluid and perhaps also to light exposure and slight desiccation. This is true also of many species of *Ichthyophis* that are of a violet or lilac color in life. However, in many if not most cases the original color or a part of it remains.

In several species the three or four anterior folds following the collars may form a more or less distinct forward-directed angle. At least one species (herein described) has folds forming distinct dorsal angles throughout much of the body.

Several species of the genus have the primary and also the secondary folds (of which there may be three or four to each primary) tending to split

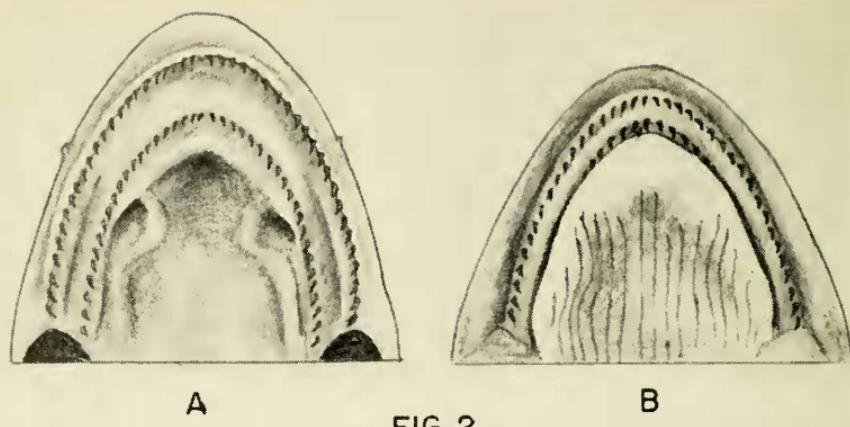


FIG. 2

FIG. 2. *Ichthyophis glutinosus* (Linnaeus). Basel Museum No. 1, Ceylon. A, palatal region of mouth and upper jaw; B, lower jaw and tongue.

dorsally or laterally. Counts made at different levels vary considerably, sometimes as much as a difference of twenty.

The larvae of *glutinosus* are relatively wider than those belonging to most other species of *Ichthyophis*. The eyes are represented by circular milky-white spots, slightly elevated, and a whitish stripe tends to connect eye to tentacle. A light area is present below and about the nostril. A low fin begins at the 16th preterminal fold, and extends to the tip of the tail and slightly below it. Two separate lateral gill-slits are present on each side. The neuromast system of the head and neck is more or less complete in the following specimen: (Natural History Museum Basel, No. 8, Ceylon): Total length, 121 mm.; width of head, 6.2; head length, snout tip to 1st nuchal groove, 7.2; width of body, 7.5; width in length, 16 times.

The penis, developed in the posterior part of the gut, is extrusible. A figure is given here showing its general appearance in situ, unextruded (from Basel Museum, No. 4).

Variation in measurements etc. are indicated in the following table of data.

Remarks: Another species, of a violet to lilac color, occurs also in Ceylon. It reaches a length perhaps as great as *glutinosus* but is slenderer and has fewer transverse folds.

As more than a single species was available to the Sarasin brothers, who seemingly were unaware of these differences, it is not impossible that their work is based on more than a single species.* However I have no certain evidence that this is the case.

* As has been suggested by Dr. L. S. Ramaswami, Current Science, vol. 16, Jan., 1947, p. 8-10.

TABLE I. Measurements and data on *Ichthyophis glutinosus*.

Museum Number	Basel 4 (6124)	K.U. 31291	K.U. 31290†	K.U. 31283†	K.U. 31293†
Sex	♂	♀	♀	♂	♀
Total Length	345*	320	300	275	263
Tail length	7.2	6.7	7	6	6
Width of head	...	10.6	10.2	9.6	8.8
Width of body	17	14.4	13.8	13.3	12.2
Width in length, times	20	22	21.7	20.6	21.5
Snout to 1st groove	...	14	13.2	12	13
Snout to 2nd groove	...	18.2	16	16	15.3
Snout to 3rd groove	...	22.6	20	21	18.2
Eye to eye	...	6.8	6.6	6.3	6.2
Eye level to snout tip	...	5.6	5.8	5.8	5.5
Tentacle to eye	...	1.8	1.8	1.8	1.7
Tentacle to nostril	...	3.7	3.6	3.7	3.35
Total folds	355	349-361	348-360	352-354	369-382
Tail folds	9	7.8	8	9	7.8
Max.-premax. teeth	...	23-23	23-23	26-27	20-21
Vomercopalatine	...	24-25	23-23	24-24	25-26
Dentary	...	22-22	21-21	20-20	21-22
Splenial	...	12-12	14-14	11-13	13-14
Posterior scalarows	7	6	6	6	6

* Estimated length, head missing and perhaps certain anterior body folds.

† Kansas Univ. Specimens from Toacumbe Estate, Numunukula, Ceylon. W. W. Phillips, collector.

Ichthyophis hypocyanus Van Hasselt (in Boie)

Ichthyophis Hasselti Fitzinger, Neue Classification der Reptilien nach ihren natürlichen Verwandtschaften, Wien, 1826, p. 63 (*nomen nudum*; Java).

Caecilia—Van Hasselt, Algemeene Konst Letter-Bede voor Het Jaar 1823, No. 41, Vrijdag den 10 den October (Letter, Kuhl and Van Hasselt); (Reprint of above in French), Bull. Sci. Nat. et Geol., 2nd sec., vol. 2, Paris, p. (dated Ceram Province of Bantam, Feb. 1, 1823).

Caecilia hypocyanea Van Hasselt, in H. Boie, in F. Boie, Isis, 1827, p. 565; I. Müller, Isis, vol. 22, 1829, p. 875; *ibid.*, vol. 24, 1831, pp. 707-710; S. Müller, Zeitschr. für Phys., vol. 4, p. 195; Arch. Anat. Phys., 1835, p. 391, pl. 8, figs. 12-14; Schlegel, Abbildungen neuer oder unvollständig bekannter Amphibien nach der Natur oder dem Leben entworfen herausgegeben und mit erläutern- den 1837-1844, p. 119, pl. 39, fig. 1 (entire animal depicted).

Epicrion glutinosum: Duméril and Bibron, Erpétologie générale, vol. 8, 1841, pp. 286-287 (part.).

Ichthyophis glutinosus: Boulenger, Catalogue of the Batrachia Gradientia s. Caudata and Batrachia Apoda in the collection of the British Museum, ed. 2, 1882, pp. 89-91 (part. but not the figure).

The first description of this species appeared under its generic name only and is a *descriptio nudus*. This was in a letter of Van Hasselt's that was

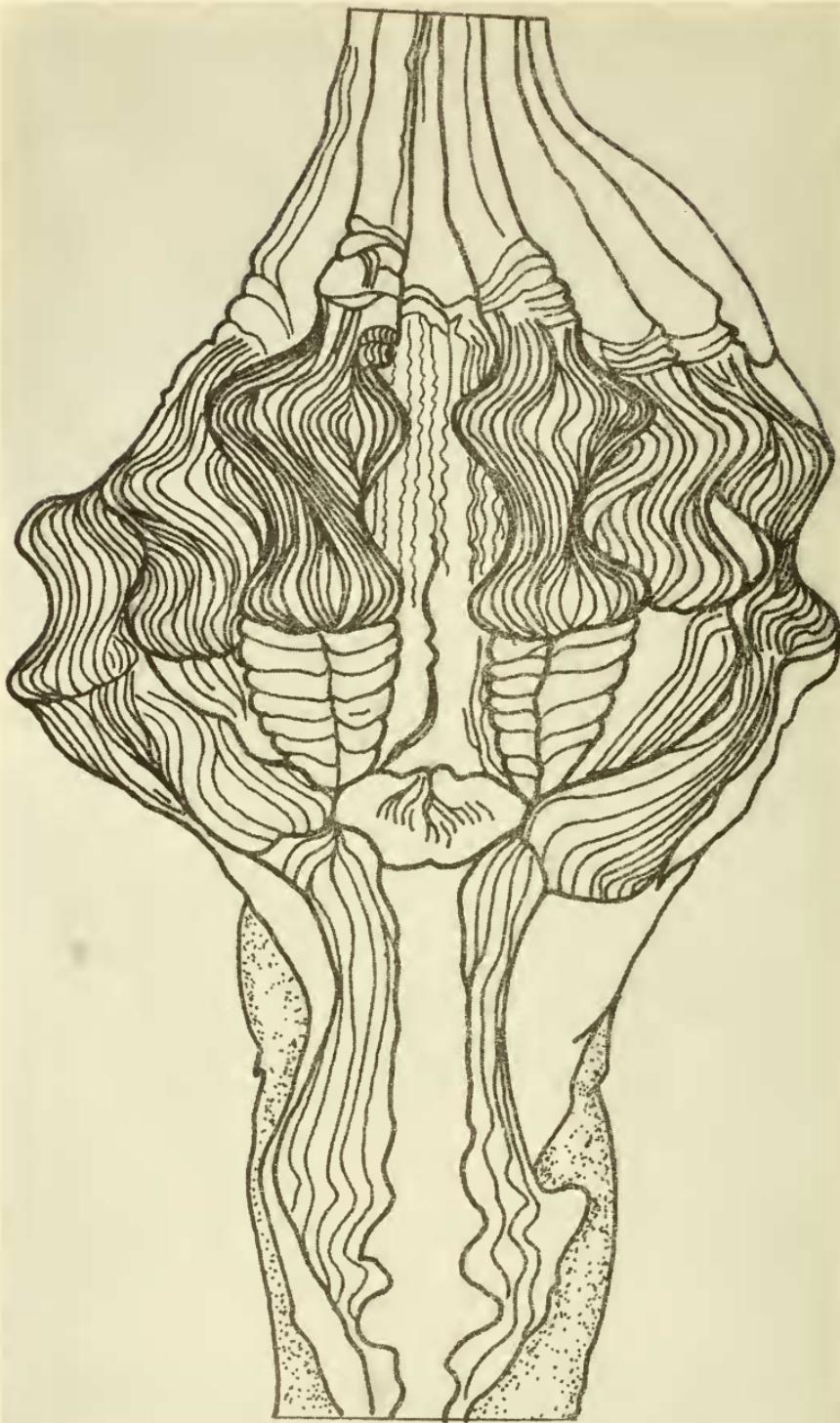


FIG. 3

FIG. 3. *Icthyophis glutinosus* (Linnaeus). Basel Museum No. 4, Ceylon. Penial organ, as seen from a ventral view, lying on the floor of the cloacal region. (Much enlarged.)

published (*Algemeene Konst en Letter-Bode*, voor Het Jaar 1823, No. 41, Vrijdag den 10 den October. Letter Kuhl and Van Hasselt) in which mention is made of a caecilian. I have not seen this publication but translated into French it was reprinted in the *Bulletin des Sciences Naturelles et de Geologie*, (deuxieme section) *Bulletin Universal des Sciences et de l'Industrie*, vol. 2, Paris. The title was "Fourth letter upon the reptiles of Java. Dated in Ceram [Serang] Province de Bantam."

I have seen the French translation, part of which, dealing with the caecilian, is here given in free English translation.

"I found this reptile in the wet and marshy places on the northern coast of Bantam [Java]. The Malays call it *Octur-doeël* and do not fear it. Its tongue is not extensile or visible except when the mouth is open and must be regarded as rudimentary. The teeth are very small, curved backwards and arranged in several rows. The eyes are hidden under the skin and are very small. The head is equally small and of a width equal to the trunk. In front of the eyes there are small elongations of the skin (*tentacules*) one half-line in length, which the animal is able to evert. The anus is found near the terminus of a very short tail rounded to a point, which appears to have a great sensitiveness. The scales are invisible at least in a living (fresh) state, and the skin is smooth and viscous, ringed by transverse grooves quite similar to those of annelids. The rings in the anterior part of the body are interrupted below. The color above is a dark olive and below steel-blue. The sides of the body are decorated by two longitudinal lines of ochreous yellow spots. Length to vent, 0.78 *sic*,* of the tail, .02.

A larval specimen of a caecilian in the Vienna Museum now bears the following data: "*Epicrium hasselti*, Wagler, Java, 1825, III, 68." The present catalogue number is 9097. The catalogue shows that it was obtained from the Leiden Museum by Natterer in March 1825 and thus may have been seen by Fitzinger. A *nomen nudum* may not be considered as having a type, else this specimen would be so considered. The specimen seemingly was one sent from Java by Van Hasselt.

The "legal" description of *Caecilia hypocyanea* was published in 1827 in a paper prepared largely if not wholly by H. Boie, who had access to Van Hasselt's notes, but which was actually published by his brother, F. Boie. The fact that he has added Van Hasselt's name after the scientific name makes it necessary that Van Hasselt be regarded as the author of the name. It is true that when his description was originally published (*loc. cit.*) under the generic designation *Cuecilia* it was a *descriptio nudas* and the type-description must date from F. Boie's work in 1827. Van Hasselt had given it a name in his unpublished notes.

* In the original Dutch publication this number was given 0.98 and is presumably correct. I am uncertain as to the unit of measurement used.

Schlegel, *loc. cit.* gives certain pertinent data, stating that Van Hasselt saw two specimens from Bantam. One was about 10 inches long (taken on muddy soil). The back was brilliant black-olive while on the underside it was steel-colored. The lateral stripes were ochre-yellow. The other was a young specimen, somewhat red-brown on the dorsal side and olive on the venter, which had been caught in the Loudemanik River. He states that Van Hasselt does not mention gill-slits or a fin. The young breathe by gills but these are lost as the animals become developed. It is probable that Schlegel did not know of the specimen sent to Vienna.

Now it would appear that the larva mentioned is the specimen in the Leiden Museum earlier studied by Müller (*Isis*, 1831, vol. 24, p. 710). He had observed its gill-slits and noted its other characteristics such as the branchial arches. He concluded that despite the resemblance of these animals to reptiles, they were really amphibia and for the known caecilians he proposed the name *Gymnophides* as the first Order of the Amphibia.

This small specimen is still extant (Leiden Museum number 2409).* It measures 115 mm. in length and has approximately 311 transverse body folds. A part of the neuromast system is still in evidence on the head. The dental formula: Maxillary-premaxillary, 13-14; vomeropalatine, 18-18; dentary, 16-17; splenial, 8-8. There are actually two gill-slits on each side, the anterior one the smaller.

Van Hasselt's notes sent from Java and preserved in the Leiden Museum have been copied for me by Dr. Brongersma, Director of the Leiden Museum:

1. He refers to the preceding small specimen giving it a specific name stating that it was found in the Loudemanick River in July, and then a question—"the young of the following?" Then follows a short Latin description of the specimen.

2. *Caecilia hypocyanea* Ceram [Serang] January, Octur-Doeël [native name]. Then follows a statement in Dutch, "Lives in muddy regions and it is said to enter into the anus of chickens."

Then follows a description in Latin.

In a previous paper I have stated that Van Hasselt described the species *C. hypocyanea* from the specimen in the Vienna Museum. This I believe now to be an error and must conclude that the type actually is a Javanese specimen, now catalogued in the Leiden Museum as No. 2408. This specimen is redescribed here.

Diagnosis: A species with a very narrow lateral stripe broken minutely in several places, appearing to be composed of a series of ochre-yellow spots; blackish olive dorsally, steel-blue ventrally in life. Transverse body folds, 314-316*; distance of tentacle from eye about one half its distance from

* In Van Hasselt's notes the young specimen is given a name but he suggests that it may be the young of the following species *C. hypocyanea*. Fortunately the name has not been published since it is indeed the young of *C. hypocyanea*.

nostril. Maxillary-premaxillary teeth, approximately 20-20; splenials, 11-11. Folds incomplete anteriorly, passing completely across back posteriorly, forming an angle ventrally. The width in length about 26 times.

Description of type (Leiden No. 2408): Head wider than neck but less than width of body; eye (lens and iris distinct) surrounded by a slightly darker ring and a minute outer ring consisting of a circle of yellowish-white glandules; tentacle close to edge of lip, preceding eye, its distance from eye (1.45 mm.) about half its distance from nostril (2.9 mm.); distance between eyes (5.8 mm.) greater than length of snout from level of eyes to tip. Two collars not strongly defined; first nuchal groove passes around back of head; second ascends sides to a point above mouth angle; second collar fuses with first dorsally and has one or two transverse folds on its posterior dorsal part. Anterior skin of head, neck and part of body glassy smooth. Following the collars, 314-316 transverse primary and secondary folds, incomplete dorsally on anterior third of body, and likewise incomplete on median ventral part; on middle third folds practically complete, those above slightly sinuous, those below forming an angle pointing backwards. On posterior third folds and grooves pass nearly directly around body, or more anteriorly may have an indistinct angle below while in front of vent they may actually curve forward; six or seven folds confined to tail which terminates in a small pointed tip; vent longitudinal its sides denticulate, the area slightly swollen.

Scales appear in the first or second fold, two rows being present in tenth fold; two rows present at middle of body with some small scattered scales; four rows in posterior folds.

Dentition: Maxillary-premaxillary teeth, 20-20; vomeropalatine, 19-19; dentary, 19-19; splenial, 11-11; latter teeth as large as the dentary teeth, and at least a part of the vomeropalatine series as large as the maxillary-premaxillaries.

Color: In life, dark olive above, steel-blue below with broken ochre-yellow lateral lines. The specimen is now brown, the neck being darkest; head somewhat olive-gray above; venter a lighter shade of brown except that on under part of tail and a little area in front of the vent the color is bluish gray. The narrow lateral yellowish lines are rather dim and the numerous breaks in it are hardly discernible.

Measurements in mm.: Length snout to vent, 258; tail length, 5; width of head, 8; width of neck, 6.8; width at middle of body, 10; tip of snout to first groove (lateral), 10; to second groove, 12.8; to 3rd groove, 16.8.

Remarks: The characteristics of the folds broken above and below suggest a relationship with the Bornean *asplenius*. However the presence of splenial teeth would seem to deny such a relationship.

* Van Hasselt's count of the folds was 320. This no doubt has included the two collars and the two folds across the second collar.

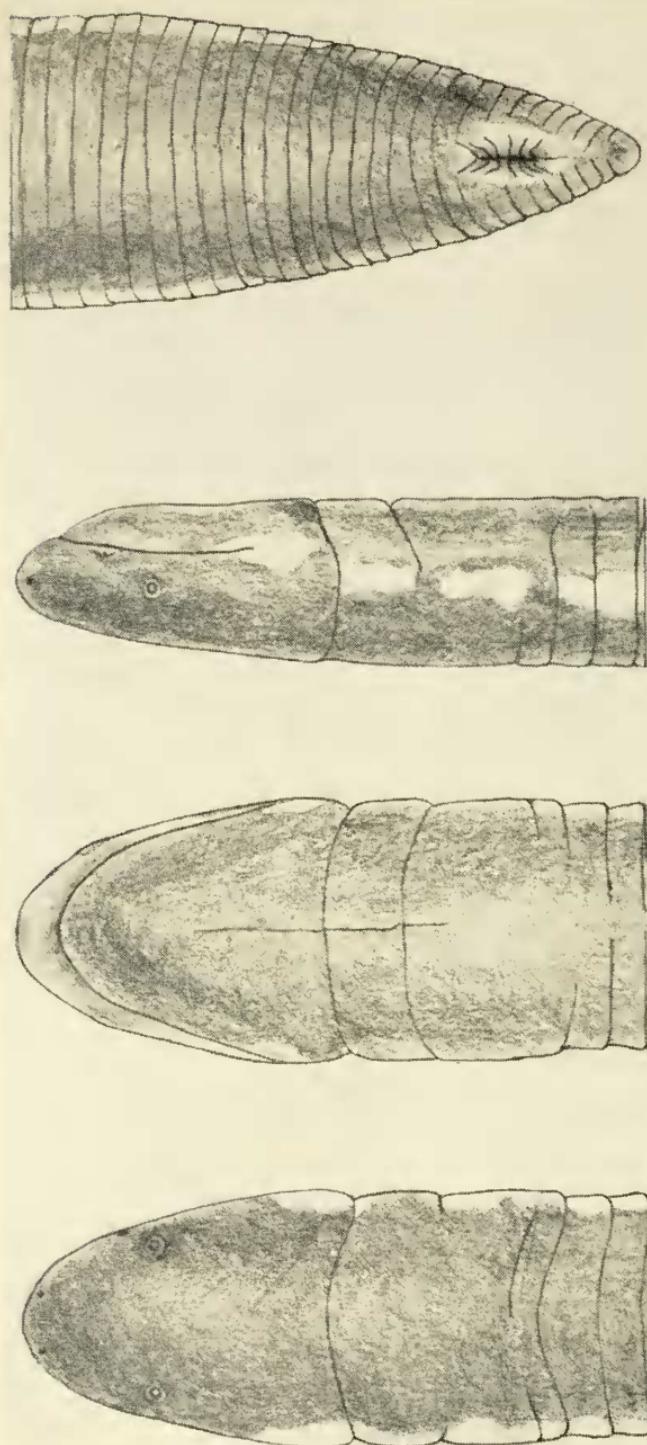


FIG. 4

FIG. 4. *Ichthyophis hypocyanus* Van Hasselt. Type. Leiden Museum N. 2408. A, B, C, three views of the head; D, terminus of body and sub-caudal region. (Actual width of head, 8 mm.)

Ichthyophis atricollaris sp. nov.

FIGS. 5, 6.

Type: Rijksmuseum van Natuurlijke Historie, Leiden, Holland, No. 10684; Long Bloee, Boven Mahakkam, Borneo.

Paratypes: Nos. 6912 D, Upper Mahakkam, and 10685, Long Bloee, Boven Mahakkam, Borneo.

Diagnosis: A broad yellow stripe extending from second collar, terminating at level of vent; head nearly uniform dark brownish violet lacking light spots at eye, tentacle and nostril; neck nearly uniformly dark above and below, the collars only dimly indicated; body dorsally uniform brownish violet slightly lighter below and on chin and neck. Primary and secondary folds, 263-300 (ventral count), 275-310 (dorsal count), complete above throughout, incomplete on anterior fifth of venter, the grooves not crossing above or below on anterior two thirds of body. Splenial teeth present, 8-8.

Description of type: Head short, rather broadly oval anteriorly; eyes small, the distance between them (6 mm.) greater than length from anterior level of eyes to tip of snout; tentacle from mouth (0.25 mm.), the distance from eye (1.52 mm.), much less than its distance from nostril (3 mm.); snout projects one millimeter beyond the mouth. First and second collars distinguishable on sides of neck but more or less fused together dorsally, less so ventrally. Primary and secondary folds together number 263 (ventral count), 275 (dorsal count), the folds complete, except for those on anterior mid-ventral region, the grooves however distinct on sides and on latter third of body; eight folds ventrally, ten dorsally on tail, the vent interrupting only three folds below. Scales begin at about the 25th fold, one or two scales being present near middorsal line; at middle of body three or four rows varying somewhat in the same fold dorsally and laterally; posterior fifth of body with seven to eight rows.

Dentition: Maxillary-premaxillary teeth, 22-22; vomeropalatine, 22-23; dentary, 19-20; splenial, 8-8. Dentary teeth largest. Choanae relatively small, the transverse diameter of one (.4 mm.) in distance between them (2.5 mm.), about 6 times; splenials on a high splenial ridge about on same plane as dentary teeth.

Color: Above brownish violet, the edges of the transverse primary and secondary folds a little lighter, especially so in the latter half of body; ventral surface a lighter shade; head lighter than dorsum, nearly uniformly colored above and below, with a vague suggestion of a lighter eye circle and a scarcely discernible lighter region about nostril; a vague small yellowish spot near mouth-angle; a white spot surrounding vent; a lateral yellow stripe from second collar to level of vent, the edges barely visible from above, narrowing a little anteriorly.

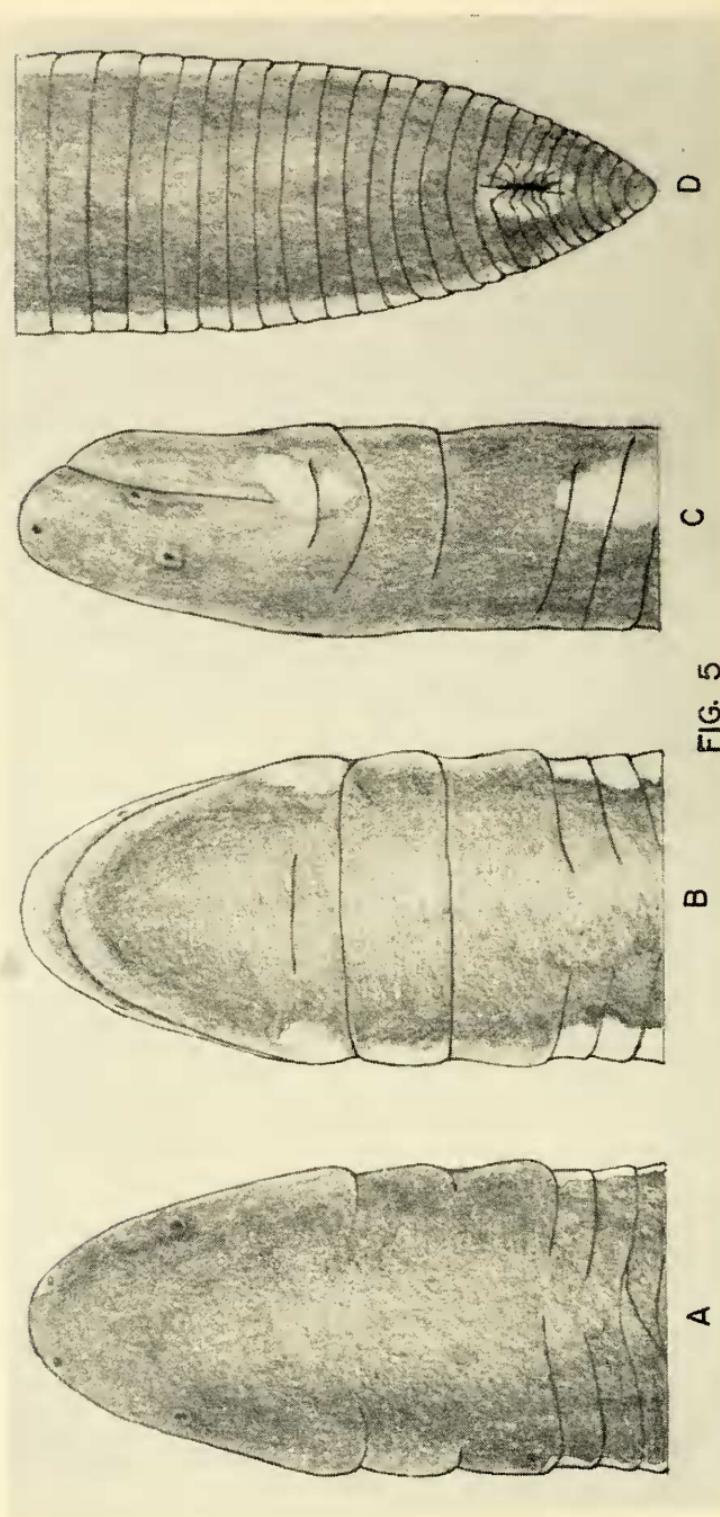


FIG. 5. *Ichthyophis atunicularis* sp. nov. Type. Leiden Museum No. 10684. A, B, C, three views of the head; D, subcaudal region. (Actual width of the head, 9.9 mm.)

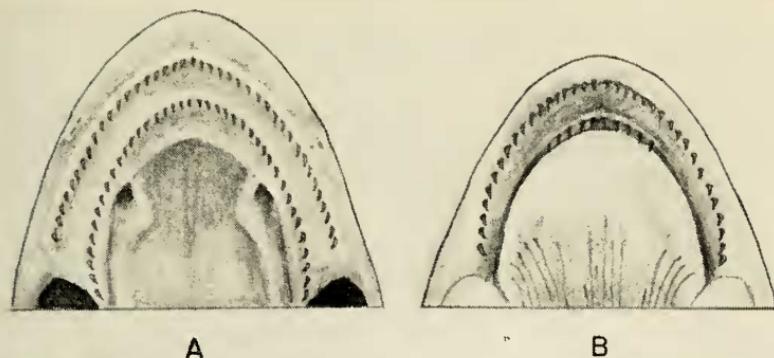


FIG. 6

FIG. 6. *Ichthyophis atricollaris* sp. nov. Type. Leiden Museum No. 10684, Long Bloe, Boven Mahakkam (river), Borneo. A, upper jaw and palatal region of mouth; B, lower jaw and tongue. (Actual width of head, 9.9 mm.)

Variation: Variation in measurements and tooth numbers is given in the following table. In color there is a strong similarity. The dark neck is the same in all, the yellow streak stopping abruptly at the 2nd collar. Dorsal folds tend to cross the back in a straight line.

In none of the specimens are the collars strongly marked, but the smallest shows the first plainly on the underside of the neck. No. 10685 has a short longitudinal whitish line under the first collar. This specimen also has the folds somewhat less distinct than the others.

TABLE 2. Table of measurements of *Ichthyophis atricollaris*.

Number Museum	10684 Leiden	10685 Leiden	6912(D) Leiden
Total length	285	255	204
Tail length	4.8	5.1	4
Width of body	11	9.5	8
Width of head	9.9	9	7.7
Snout tip to 1st groove	10	11	9
Snout tip to 2nd groove	13.7	13.2	11
Snout tip to 3rd groove	17.2	17	13.4
Tentacle to eye	1.52	1.5	1.25
Tentacle to nostril	3	2.5	2.4
	V D	V D	V D
Total folds	263-275	300-310	293-303
Folds on tail	8-10	8-9	8-8
Maxillary-premaxillary teeth	22-22	25-27	24-24
Vomeropalatine	22-23	20-20	20-19
Dentary	19-20	19-19	18-19
Splenial	8-8	8.5+	8-8
Width in length (times)	26	26.8	25.5

In all the angle of the folds on the venter is less acute than in most other species now recognized in the genus *Ichthyophis*.

The type specimen was taken on the Upper Mahakkam River, at Long Bloee, by the Nieuwenhuis Borneo Expedition. The paratype No. 10685 is from the same locality and No. 6912 (D) from Boven Mahakkam; the exact locality may or may not be known.

Three other species were taken in the same general area. At least two other species seemingly were taken at the same place since No. 6912 is one of a series of five caecilians bearing this same number and locality.

Ichthyophis elongatus sp. nov.

Figs. 7, 8.

Holotype: Naturhistorische Museum Wien. No. 9094. Padang, Sumatra.

Paratype: N.M.W. No. 9092, Domenik, Sumatra.

Diagnosis: Head a little wider than body. Transverse folds, 274-290, three confined to tail; folds not complete across anterior two thirds of body; maxillary-premaxillary teeth, 28-32; splenial, 14-16; latter half of body with six scalarows in each fold; *body width in length 37 to 40 times*; a narrow lateral yellow stripe. Tip of tail acuminate.

Description of type: Head rather wider than body; eyes distinct with a narrow white ring; distance of tentacle to eye (1.65 mm.) a little less than half its distance to nostril (3.45 mm.); eye to nostril, 4.5 mm.; tentacle from lip, 0.3 mm.; first nuchal groove distinct below and on sides, dimly visible, curving forward on back of head; second groove distinct below and on sides; third groove visible across back and on venter except in mid-ventral region; the two collars fused together dorsally, the second divided dorsally by a transverse groove visible below only at sides.

Folds following collars, 274 (dorsal count), 277 (ventral count), the folds and grooves incomplete on the dorsal surface; anteriorly separated by a distance of three millimeters which gradually narrows until near middle of body, they become complete; except for two anterior centimeters, the folds are complete ventrally, forming an acute angle pointing backwards for about seven eights of the body length. The ventral grooves are not in evidence and the complete fold and angle often cannot be discerned unless the specimen is somewhat desiccated. Only three folds on tail, two and a half interrupted by the longitudinal vent; a pair of glandular swellings near anterior end of vent.

Small scales begin on second collar; at middle of body seven rows present, the scales large, variable in size, and these continued to near vent; seven or eight rows posteriorly.

Dentition (of type and paratype): Maxillary-premaxillary, 32-32, 29-28; vomeropalatine, 27-27, 30-30; dentary, 29-29, 27-27; splenial, 14-14, 16-16.

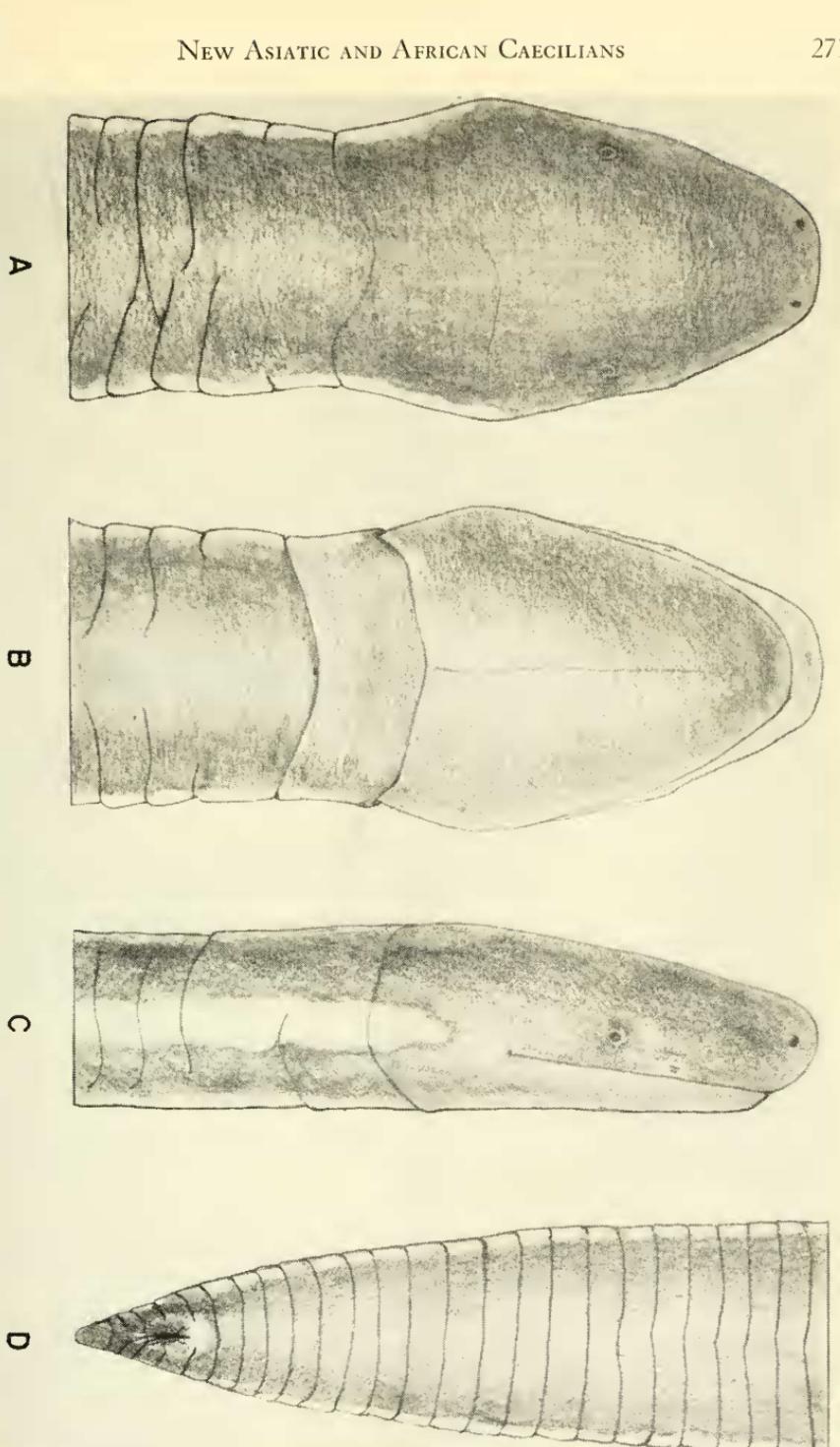


FIG. 7. *Ichthyophis elongatus* sp. nov. Type. Vienna Museum No. 9094, Padang, Sumatra. A, B, C, three views of the head; D, subcaudal area. (Actual width of head, circa 10 mm.)

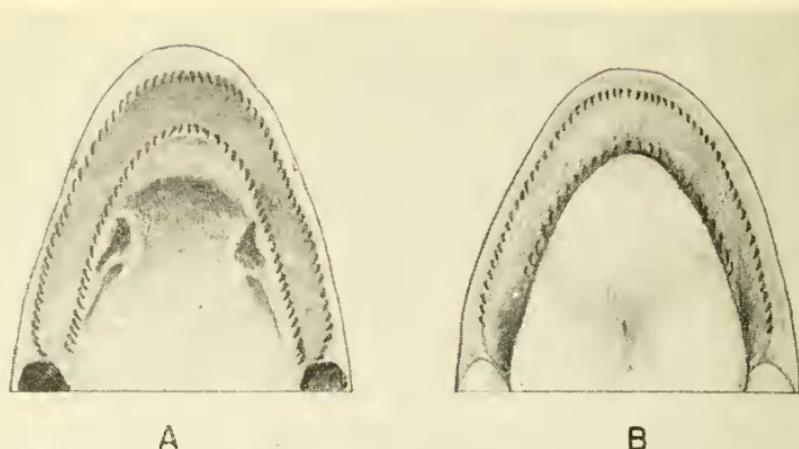


FIG. 8

FIG. 8. *Ichthyophis elongatus* sp. nov. Type. Vienna Museum No. 9094, Padang, Sumatra. A, Upper jaw and palatal view of mouth. (Actual width of head, circa 10 mm.)

Choanae semilunate, lateral, the diameter of one in distance between them, 4½ times; tongue narrowed anteriorly, not covering spenials.

Color: Dark lilac dorsally, somewhat grayish lilac of a slightly lighter shade ventrally; a yellow to cream lateral stripe about one millimeter wide reaching to near eye, terminating anterior to vent, the stripe broken on second collar; a white spot surrounding vent; a light ring about eye; a light spot at nostril and tentacle, and a light area above tentacle; top of head somewhat brownish.

Measurements in mm. (type and paratype): Total length, 300, 280; tail length, 3.4, 3.5; width of body, 7.6, 8; width in length (about), 40 times, about 37 times; snout to first groove, 12, 11.2; to second groove, 14.9, 15.9; to third groove, 19, 19.8; eye to eye, 6, 6; eye level to snout tip, 5.4, 5.

Variation: The transverse body folds of the paratype are 287 (dorsal count) and 290 (ventral count). The tail has three folds with a fourth indistinctly indicated near the tip. In both, the body and tail are narrowed, the width of the tail at vent being three millimeters. It is flattened ventrally ending in a fine point.

In the paratype the general lilac color is of a lighter shade and the lateral stripe is somewhat more distinct and a trifle wider at least at certain points; the head is somewhat lighter in color and the tip of the snout is cream. The second collar dorsally is about one half divided by a transverse groove.

Remarks: Incomplete dorsal folds appear in another species, occurring in Borneo, which, however, lacks vomerine teeth; the number of dorsal folds is 264-270; and the width in length is about 24 times instead of 37 to 40 times.

Ichthyophis biangularis sp. nov.

Figs. 9, 10.

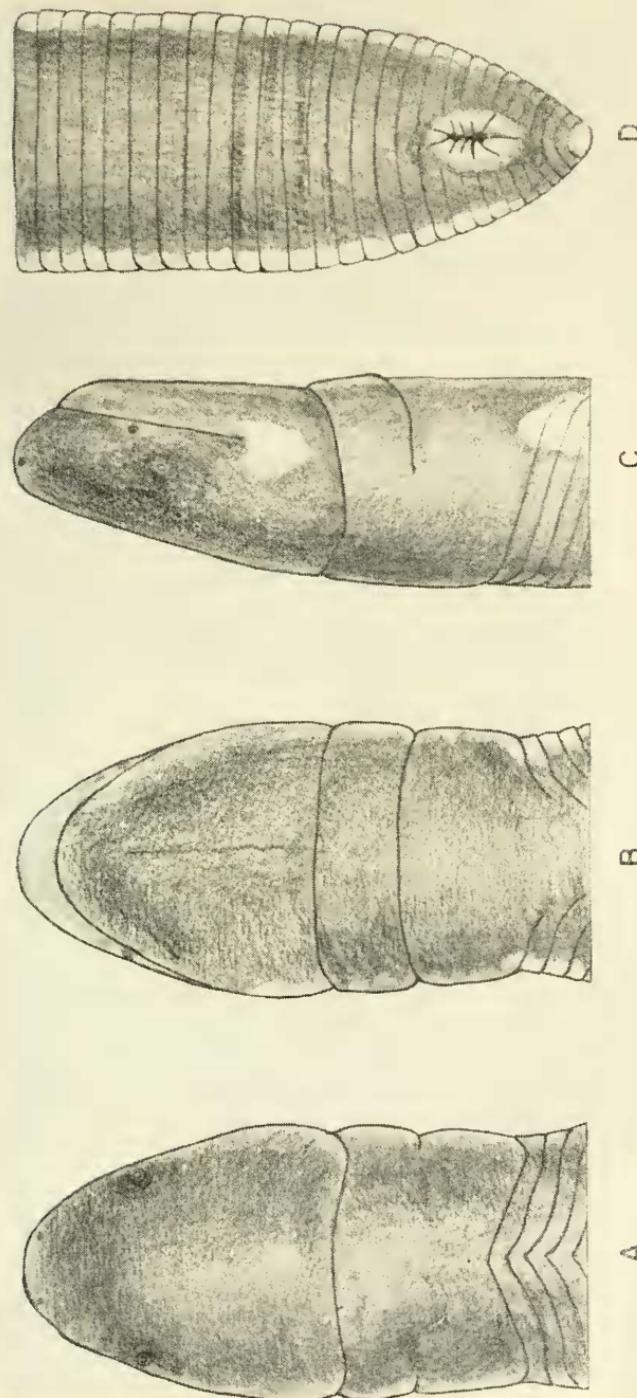


FIG. 9
Ichthyophis biangulatus sp. nov. Type. British Museum No. 72.2.19.59, A. Matang Mt. Sarawak, Borneo. A, B, C, three views of head; D, subcaudal area. (Width of head, 8.2 mm.)

Holotype: British Museum No. 72.2.19.59,A, Matang (Mt.) Sarawak, Borneo; Everett, Coll.

Diagnosis: Eye distinct in socket; tentacle twice as close to eye as to nostril; total folds behind collars, 330-333, with ten confined to tail; *transverse folds distinctly angular above as below*, throughout most of body; body width in body length about 26 times. Scales begin in first transverse fold, four rows at middle of body, four rows posteriorly. Color blackish slate above and below with a yellow lateral line terminating anteriorly at second collar; yellow spot at mouth angle not dividing.

Description of type: (Skin partly removed from head.) Eye dimly distinct with a slightly lighter ring about it; tentacle much closer to eye (1.2 mm.) than to nostril (2.4 mm.); eye to nostril, 3.5 mm. First and second collars fused above; collars distinct below, the first groove seemingly interrupted on dorsal surface; second groove distinct below and on sides, scarcely visible from above, bordered below by a light line. Third groove distinct above interrupted mid-ventrally where the second collar fuses with the first and second transverse folds.

Counts of transverse folds vary but little. Two counts show, dorsally, 333, ventrally, 330; ten folds on tail (from anterior edge of vent), four interrupted by vent, six more or less complete behind vent; folds forming a distinct angle dorsally and a somewhat more acute angle ventrally, except on the fifth of body preceding vent where dorsal and ventral grooves and folds run nearly directly across.

Scales begin in the first folds following collars, at least two rows present on the dorsal surface; at mid-body there are three well-defined rows, and a fourth complete or incomplete; posteriorly there are four well-developed rows.

Dentition: The teeth have been exposed and lost or removed. The following counts are close approximations: Maxillary-premaxillary teeth, 25-26; prevomeropalatine, 24-24; dentary, 19-19; splenial, 2-2.

Color: Generally blackish slate, the venter scarcely less dark than dorsum; a dull narrow, irregular-edged stripe on sides, beginning at second collar and terminating posteriorly behind level of vent; a yellowish-cream spot at jaw angle not branching; a white spot about vent, a very narrow dim light ring about eye, and a lighter spot at tentacle (skin in area about nostrils removed).

Skull: The exposed parts of the skull show the eye in a circular socket completely separated from the fenestral opening of tentacle; no diastema between the squamosal and parietal bones; eye socket between maxillary, squamosal and a small supraocular; a preocular and a septomaxilla or "lateral nasal"; nasal fused with prefrontal; frontals and parietals distinct, no ethmoid visible; premaxillaries distinct with premaxillary teeth, 8-8, followed by 17 or 18 maxillary teeth on each side; tentacular aperature pierced in maxillary.

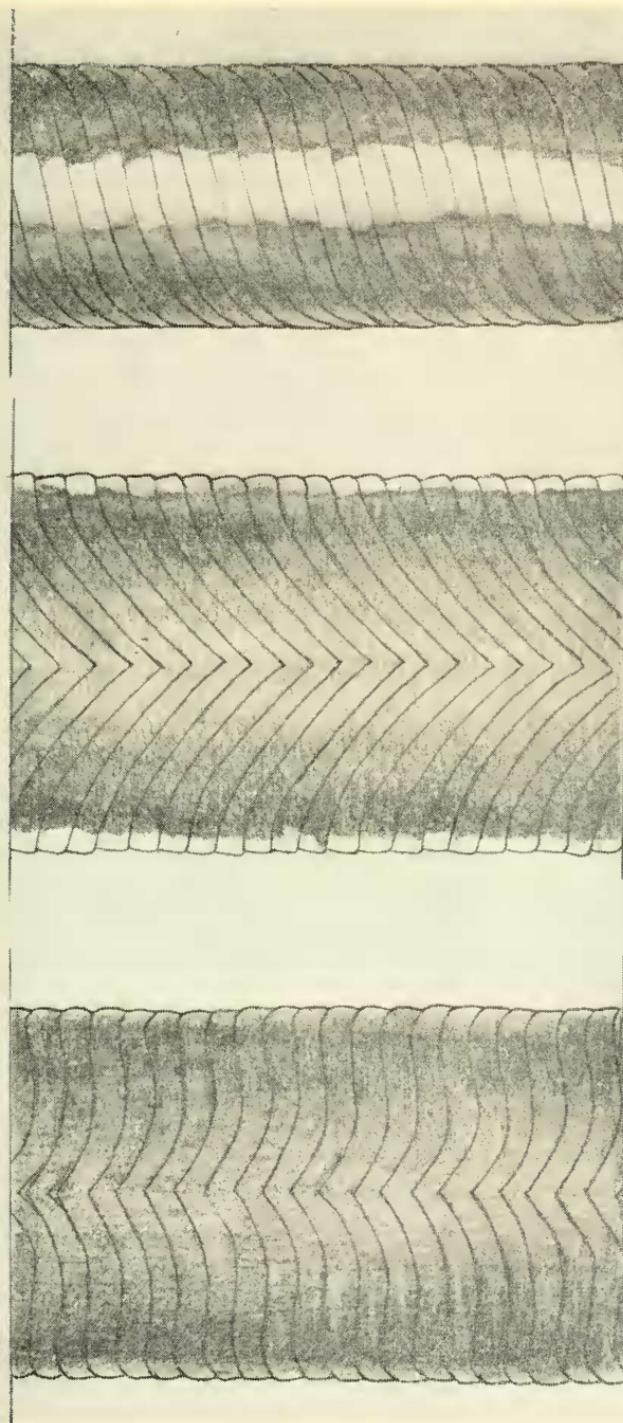


FIG. 10

FIG. 10. *Ichthyophis biangularis* sp. nov. Type. British Museum No. 72.2. 19.59. A. Matang Mt. Sarawak, Borneo. A, B, C, three views of dorsal, ventral and lateral views of the anterior part of body showing biangulate condition of the transverse body folds. (Width of body at this point, circa 9.2 mm.)

Measurements in mm.: Total length, 258; tail, 5.8; width of body, 9.8; width of head, 8.2; tip of snout to first groove, 10; to second groove, 12.5; to third groove, 16.5. Width in length, 26.3 times.

Remarks: The type number (BM 72.2.19.59) originally included three specimens. The other two are larvae and in my opinion do not belong to the species described here. The two larvae likewise represent two species. The larger larva, here designated A, has 261-256 transverse folds. The folds cross the back and are perhaps slightly angulate in the anterior folds. The smaller one, here called B, has the folds failing to cross the median dorsal part of the body. It may be the young of *Ichthyophis asplenioides* herein described.

The name *biangularis* is from Latin, *bi*=two, *angulus*=angle.

Ichthyophis pseudangularis sp. nov.

Figs. 11, 12, 13.

Holotype: Musee d'Histoire Naturelle Bale (Suisse) No. 4412. Collected in Ceylon by Paul and Fritz Sarasin.

Diagnosis: A medium-sized species having a yellow lateral stripe extending the length of the body, more or less broken on collars, and a yellow cream spot at jaw angle dividing and sending a branch onto lower jaw; transverse folds, 269-271, five confined to tail; tentacle twice as close to eye as to nostril; body width in total length about 26 times; splenial teeth 10-9; dorsal transverse folds curving forward on median line, somewhat angular anteriorly, strongly angular on venter except on posterior fifth of body.

Description of type: Head somewhat bluntly conical; eyes small but distinct, in a socket; tentacle to eye, 1.5 mm., to nostril, 2.9 mm.; distance between eyes (straight line), 5.3 mm.; level of eyes to tip of snout, 4.6 mm.; nostrils plainly visible from above; a slight median elevation on dorsum extending along body for about half its length; a dorsolateral ridge on sides of body extending to tail, making body somewhat quadrangular in cross-section; tentacle very close to edge of lip; eyes lateral.

First nuchal groove passes completely around head; second groove distinct across throat reaching up on sides to level of mouth-angle; third groove indistinct; the two collars fused dorsally, the second with two transverse folds on its posterior part, neither of which cross venter.

Folds following collars 269-272 (variable at different body levels), the dorsal folds running somewhat forward and forming a distinct angle or sharp curve pointing forward becoming somewhat more obtuse towards middle of body; ventrally folds form an acute angle pointing backwards except on posterior fifth of body in which the folds pass nearly straight across dorsally and ventrally. A few folds following collars are incomplete ventrally.

Scales appear on the second collar; in the tenth fold there are at least

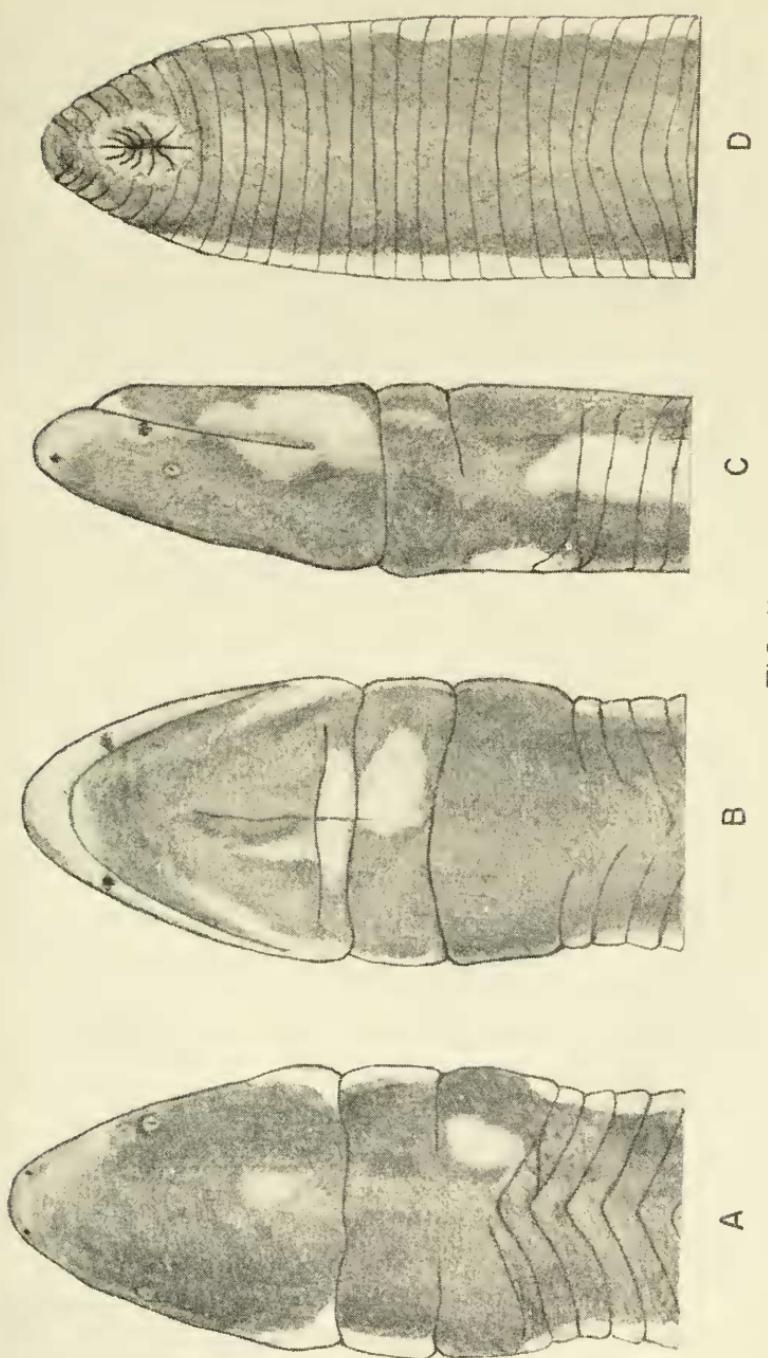


FIG. 11. *Ichthyophis pseudodugitensis* sp. nov. Type. Basel Museum No. 4412. Ceylon. A, B, C, three views of head; D, subcaudal area. (Actual width of head, 8.5 mm.)

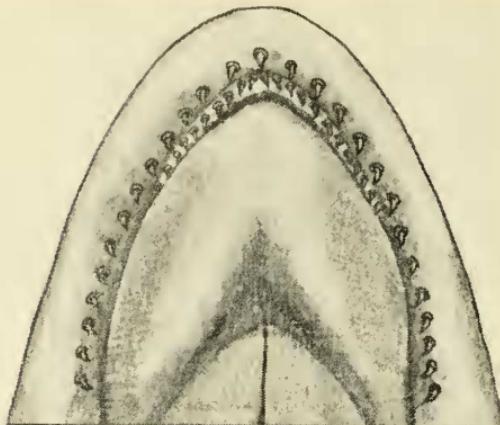


FIG. 12

FIG. 12. *Ichthyophis pseudangularis* sp. nov. Type. Basel Museum No. 4412, Ceylon. A, view of lower jaw and tongue.

two incomplete scalarrows. In latter half of body there are six more or less complete rows of scales in each fold.

Dentition: Maxillary-premaxillary teeth, 18-19; vomeropalatine, 22-22; dentary, 18-18; splenial, 10-9. The anterolateral dentaries are the largest teeth.

Tongue somewhat swollen laterally, the tip not covering the splenials.

Color: Above slate to lavender slate; somewhat brownish slate on venter; a narrow yellow to cream lateral stripe more or less interrupted on collars, terminating posteriorly behind level of vent; posterior to angle of jaw a yellowish cream spot which bifurcates sending a branch along lower jaw, the yellow not reaching eye along upper jaw. Some indistinct cream marks on chin, and one asymmetrical spot above second collar: a small cream spot at vent, one at tentacle, and one at nostril. Tip of snout light cream.

Measurements in mm.: Total length, 225; tail, 3.5; width of body, 8.6; width of head at first collar, 8.5; width in length, 26 times.

Remarks: The name *pseudangularis* is from Greek, *pseudo*, false and Latin, *angulus*, angle.

Ichthyophis asplenius sp. nov.

FIGS. 14, 15.

Holotype: Rijksmuseum van Natuurlijke Historie, Leiden, No. 6912 B. From, Boven Mahakkam, Borneo.

Paratype: R.N.H. Leiden, No. 6912 A. Topotype. Museo Civico Genova No. 32195, Sarawak, Borneo.

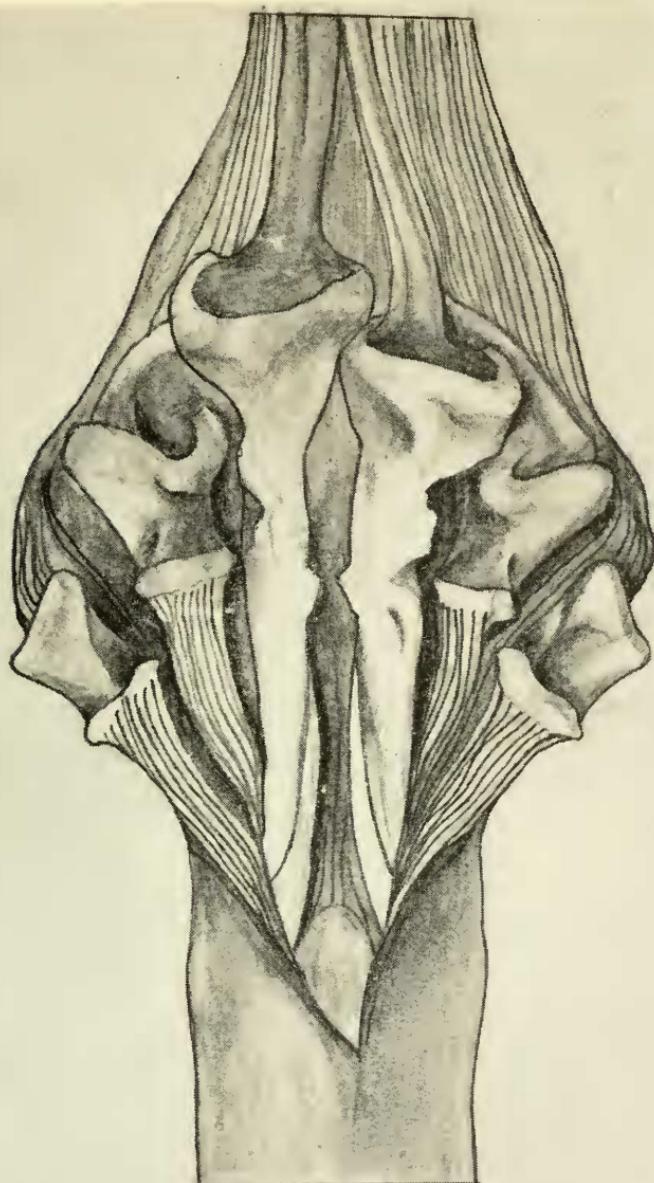


FIG. 13

FIG. 13. *Ichthyophis pseudangularis* sp. nov. Type. Basel Museum No. 4412, Ceylon. Penial organ seen from ventral view, lying in cloacal region. (Much enlarged.)

Diagnosis: A moderately broad lateral yellow stripe broken or not on collar. Eye in socket, the tentacle much closer to eye than to nostril; width

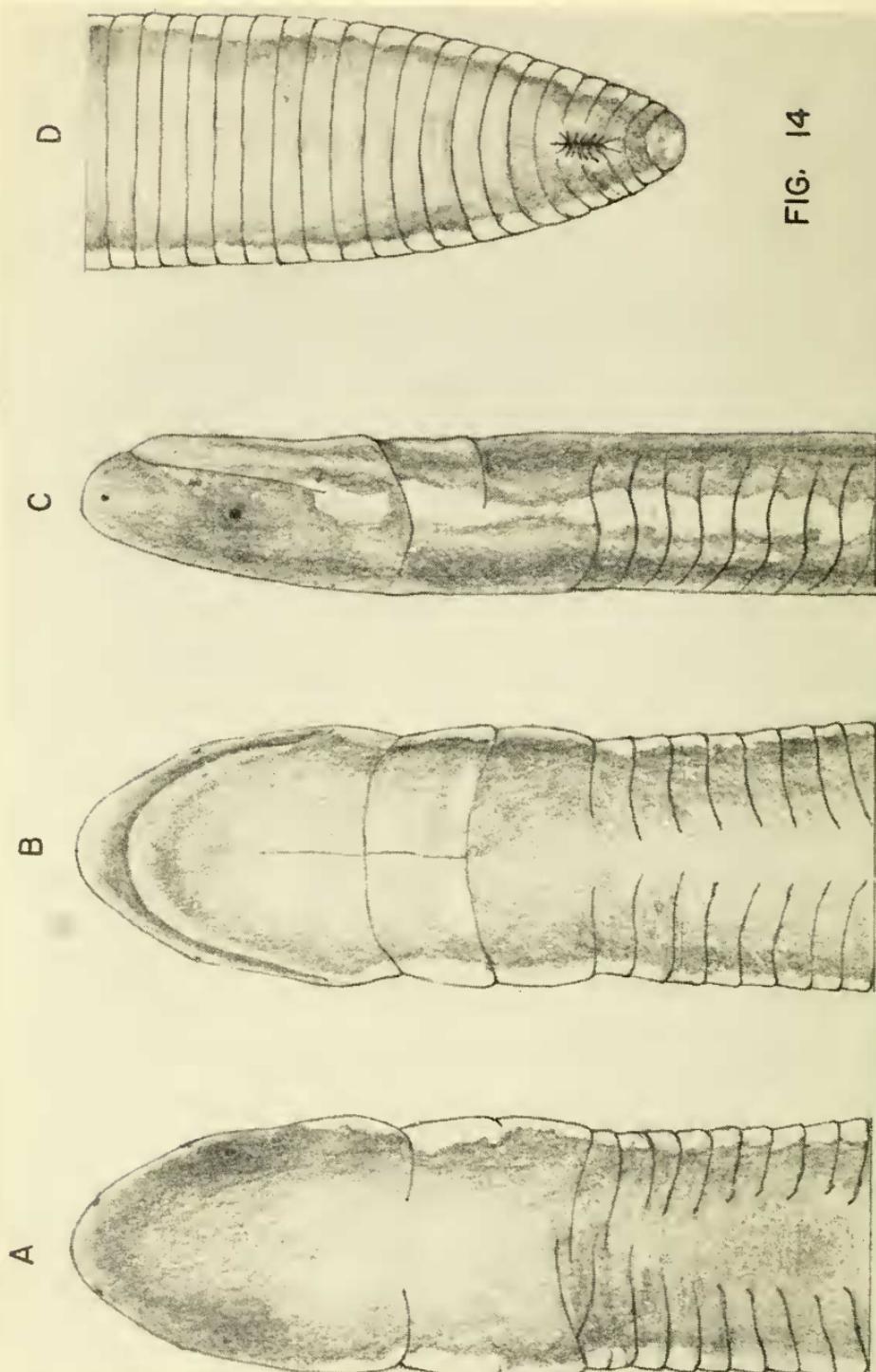


FIG. 14. *Ichthyophis asplenioides* sp. nov. Type. Leiden Museum No. 6912 D. Boven Mahakkam (river), Borneo. A, B, C, three views of head; D, subcaudal area. (Actual width of head, 6.5 mm.)

in length, 23-26 times; total folds, 247-270; no splenial teeth in transformed specimens; grooves and folds do not cross the back except in the posterior half of body, some folds tending to form angles directed forward; throughout most of body, grooves do not cross venter but the folds are complete, forming a ventral angle pointing backwards except on latter fourth of body where they, with the grooves, pass directly across.

Description of the type: Head moderate. Eye visible, somewhat elevated but dim; distance between eyes (4.4 mm.) considerably greater than distance from level of eyes to tip of snout; snout projecting about one millimeter beyond mouth; distance of tentacle from eye (1.2 mm.) much less than distance to nostril (2.15 mm.); eye to nostril, 3 mm.; tentacle to edge of lip, 0.2 mm.; nostrils nearly terminal but visible from directly above head.

First and second collars fused above, distinct below; first nuchal groove complete below, broken in middorsal region of head; second groove preceded below by a slight fold, visible laterally when seen from above; third groove vaguely marked above and on sides; second collar fused below with the following body fold. A fold, similar to a body fold is present dorsally on back of first collar. Primary and secondary folds following collars are 26-270, the folds and grooves incomplete across back on anterior half of the body being separated on median line anteriorly by a distance of three to three and a half millimeters, the distance between growing gradually shorter until folds become complete near the middle of body. The grooves are complete only on latter fourth of body; ventrally folds form a backward-pointing angle except on latter fifth of body where the grooves run straight across venter; five folds on tail, three of which are behind vent; vent longitudinal, short; glandular swellings at side of vent not evident.

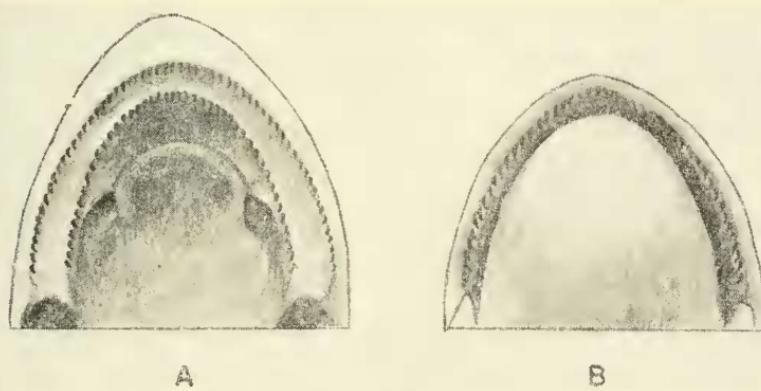


FIG. 15

FIG. 15. *Ichthyophis asplenioides* sp. nov. Type. Leiden Museum No. 6912 D, Boven Mahakkam (Upper Mahakkam river), Borneo. A, upper jaw and palatal region of the mouth; B, lower jaw and tongue. (Actual width of head, 6.5 mm.)

Very small scales present in the 30th fold and there may be a few scattered scales preceding this; at middle of body about three rows where the scales can be traced to the mid-ventral line; posteriorly four rows present with occasional scales that may tend to form a fifth row.

Dentition: (of type and paratype respectively): maxillary-premaxillary teeth, 26-26, 27-28; vomeropalatine, 26-27, 29-29; dentary, 25-25, 25-25; splenial, 0-0, 0-0. The teeth all small, the dentary teeth perhaps the largest; the vomeropalatine teeth minute.

Color: Generally rather dark brownish lilac, very nearly the same shade above and below; a yellowish lateral stripe, with rather uneven edges, about 1.5 mm. wide beginning on head at tentacle and extending to level of vent. Head slightly olive-brown; only a suggestion of a light spot at vent; a very faint ring about eye; tip of snout light.

Measurements in mm. (of type and topotypic paratype): Total length, 207, 202; tail length, 3, 3.2; width of body, 8.8, 8.2; width of head, 6.5, 6.6; between eyes, 4.8, 4.4; eye level to tip of snout, 3.5, 3.5; eye to tentacle, 1.2, 1.25; tentacle to nostril, 2.2, 2.5.

Variation: The Sarawak paratype in Genova measures 191 mm., the tail, 3.3 mm.; it lacks splenial teeth and has the typical incomplete folds. Near the middle of the body where the folds are complete the folds tend to form a slight median angle directed forward; the incomplete folds tend to curve forward somewhat. The ventral count of the folds is 247, the dorsolateral count 254. The width of the body (7.2) in the total length is a little more than 26 times.

The character of incomplete folds in the anterior part of the body occurs in a Sumatran form herein described. This latter form however differs in having a slightly higher average number of folds. The body width in length is nearly 40 times instead of 23-26 times, and there is present a series of 14-14, 16-16 splenial teeth. The head is proportionally larger and wider.

When the folds first meet on the back near the middle of the body they may tend to form an obtuse angle or a median curve.

Remarks: Number 5 (Basel Natural History Museum), and number 9090 (Vienna Museum) are two problematical specimens both purporting to be from Ceylon that seem to show a relationship with *Ichthyophis asplenioides*. They agree in two significant characters: the incomplete folds above and below on a considerable part of the body, and the complete absence of splenial teeth. There are certain small differences and a rather considerable difference in the other three tooth-series. Thus the maxillary-premaxillary teeth are 26-26 to 28-28; vomeropalatine, 26-27 to 29-29; the dentary, 25-25. If the localities of these two specimens are correct it shows two forms occupying ranges in the easternmost and westernmost points in the range of the genus, and lacking, as far as known, in any closely related forms in the area that separates them.

Other data on these two specimens No. 5 and No. 9090 respectively are: Total length, 220♀ and 203♀; tail length, 3.7, 3; head width, 7, 6.2; body width, 8.8, 7; width in length, 25, 29 times; tip of snout to first nuchal groove, 8, 7.8; to second groove, 11.8, 10; to third groove, 15, 13; eye to eye, 5, 4.3; level of eyes to snout tip, 3.85, 3.45; tentacle to eye, 1.1, 1.1; tentacle to nostril, 2.1, 2.2; total folds ventral and dorsolateral counts, 277-288, 275-281; tail folds, 4, 5-6. There are four or five rows of scales in the posterior folds.

It would not be impossible that each of these specimens bears an incorrect locality label. However I have no evidence that this is true. Rediscovery of this form in Ceylon is necessary before one can deal with these specimens with certainty.

A series of five Malayan specimens from the National Museum of Singapore (formerly Raffles Museum) are referred to this species. On the Loan Invoice these are listed: No. 2 (R 8928, 7.12.42, Forest Research Institute, Kepong; No. 3 (R 9246. 30. 12. 49.) Forest Research Institute, Bukit Lapong; No. 4 (R 8081. 269. 49.) Forest Research Institute, Kepong; No. 5, Forest Research Institute, Bukit Lapong, Selangor; No. 10 (28. 5. 31.) Tg. Rambutan, Perak, Malaya.

These specimens are from 209 to 242 mm. in length, the width in length 27 to 30 times. There is but little difference in the dorsal and ventral counts of the folds (primaries and secondaries together which are not distinguishable. The counts vary from 251 to 279. There is no trace of splenial teeth. All are of the same brown color with a rather broad yellow lateral stripe from head to tail. The grooves are present laterally but grooves and folds are broken dorsally on much of the anterior third of the body. I do not consider these as paratypes.

Ichthyophis forcarti sp. nov.

Figs. 16, 17.

Holotype: Musee d'Histoire Naturelle Bale (Suisse) No. 4411, Ceylon, Paul and Fritz Sarasin, collectors.

Diagnosis: Transverse folds 346-348, forming a sharp median curve (rarely angulate), pointing forward on anterior half of body, posteriorly crossing body nearly in a straight line; ventrally folds form an angle pointing backwards except in posterior part where they pass directly across; splenial teeth, 5-5. Folds and grooves complete above and below; eye distinct, the tentacle twice as close to eye as to nostril; body width in length 27 times; a narrow irregular-edged yellow lateral line from the second collar to close to tip of tail.

Description of type: Head not wider than neck and body, the eyes distinct in sockets, the distance between them (5.5 mm.) greater than distance from eye level to snout tip (4 mm.); tentacle much closer to eye (1.5 mm.) than to

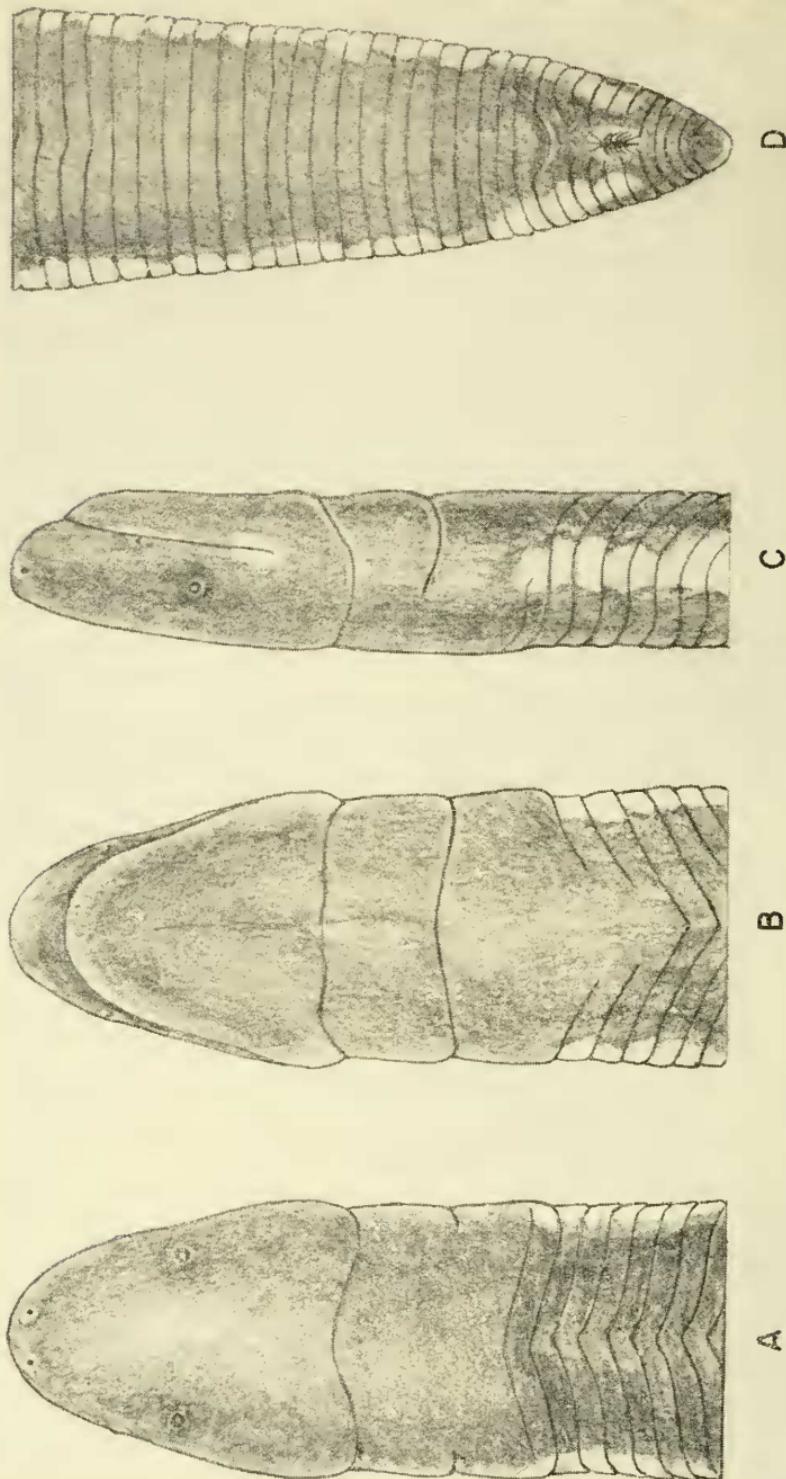


FIG. 16. *Ichthyophis forcani* sp. nov. Type. Basel Museum No. 4411, Ceylon. A, B, C, three views of head; D, subcaudal area. Actual width of head, 8.5 mm.)

nostril (2.65 mm.); eye to nostril, 3.5 mm.; tentacle to lip, 0.2 mm.; first and second collars fused above, distinct below, the nuchal grooves shallow, bordered by a slightly lighter line; second collar with one transverse fold above on posterior part, below mesially fused to first transverse fold posterior to second collar; 346-348 transverse folds complete above and below except anterior three or four on median ventral surface; nine folds on tail, the two preceding vent forming an angle directed backward into vent; four or five complete folds behind vent. Five or six anterior folds form angles dorsally.

Scales begin on back of second collar (the surface of body is slightly dehydrated and scales visible throughout); at middle of body maximum scale-rows in each fold, four or five; at posterior part, five rows, only a part of which are complete on sides and ventrally.

Dentition: Maxillary-premaxillary teeth, 25-26; vomeropalatine, 24-24; dentary, 18-19; splenial 5-(?). The teeth are small without much contrast in size except splenials, which are much smaller and arise at a much lower point than dentaries; splenials scarcely reach level of the bases of dentary teeth. Choanae lateral, directed forward, the transverse diameter of one contained in the distance between them somewhat more than three times; tongue plump, rounded anteriorly, covering splenials which scarcely reach surface of gums.

Color: Lilac-brown above and below, the head slightly olive-brown, somewhat dimly mottled; a lateral yellow stripe beginning behind second collar and terminating behind vent; light yellow mark at mouth-angle; a small circular light mark above eye; a small light spot at tentacle, one below nostril and one surrounding vent, the latter narrowly separated from the

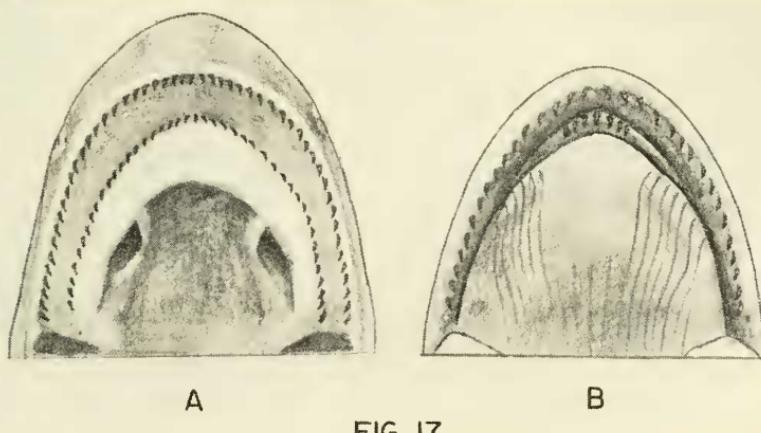


FIG. 17

FIG. 17. *Ichthyophis forcarti* sp. nov. Type. Basal Museum No. 4411, Ceylon. A, upper jaws and palatal region of mouth; B, lower jaws and tongue. (Actual head width, 8.5 mm.)

lateral stripes. In the present slightly dehydrated state each fold shows a narrow light line caused by the scales and glands showing through the skin.

Measurements in mm.: Total length, 236; tail, 4; width of body, 8.6; width of head, 8.5; snout tip to first groove, 10.3; to second groove, 13.5; to third groove, 16.2; width in length, 27.4 times.

Remarks: The exact locality at which this specimen was taken is seemingly no longer known.

The species is named for Dr. Lothar Forcart of the Natural History Museum of Basel.

Ichthyophis weberi Taylor

Figs. 18, 19.

*Ichthyophis weberi** Taylor, Philippine Journ. Sci., vol. 16, no. 3, March, 1920, pp. 227-228 (type-locality, Malatgan River, Palawan, Philippine Islands, C. M. Weber, collector); Dept. Agri. Nat. Resour., Bureau of Science, Manila, publ. 15, Dec. 15, 1921, pp. 26-27 (reprinting of the type-description); Univ. Kansas Sci. Bull., vol. 40, Apr. 20, 1960, pp. 43-44 (removed from synonymy).

Ichthyophis monochrous: Van Kampen (part.), The Amphibia of the Indo-Australian Archipelago, Leyden, 1923, pp. 3-4, 282; Inger, (part.), Fieldiana: Zoology, vol. 33, no. 4, July 23, 1954, pp. 207, 209.

Diagnosis: A small species reaching a length of 256 mm.; above uniform dark lilac to violet, the ventral surface a little lighter and showing a slightly brownish lilac shade; cream spot at vent; eye in a socket, visible through skin. Transverse folds (primaries, secondaris and tertiaries indistinguishable from each other superficially), from 304-322, ventral count to 313-329, dorsal count; splenial teeth absent in adult, present in at least some larva. Body width in total length about 25 times. Vertebrae, 104-108.

Description of the neotype: (Stanford University No. 21758): Head rather short (10 x 8.5 mm.), rather flattened; distance between eyes (in straight line), 5.85 mm.; length from level of eyes to tip of snout, 4.9 mm.; nostrils plainly visible from above, directed upward and slightly backward; tentacle, small rather conical, close to lip (0.25 mm.), its distance from eye (1.8 mm.) much less than its distance from nostril (3.2 mm.); snout projecting about 1 mm. beyond mouth; eye from mouth, 1.4 mm., from nostril, 3.9 mm.

Two collars, first strongly defined on throat but first groove, while distinct laterally, is incomplete above; second groove distinct laterally, scarcely visible from above; third groove limiting second collar is visible laterally but incomplete below and only dimly visible above; an indistinct groove separates a transverse fold on the back part of second collar.

* The holotype of this species was destroyed in the Second World War during one of the final battles in Manila, which partially destroyed the Bureau of Science. I hereby designate Stanford University, No. 21758 from near Iwahig, Palawan (virtually a topotype) as a neotype.

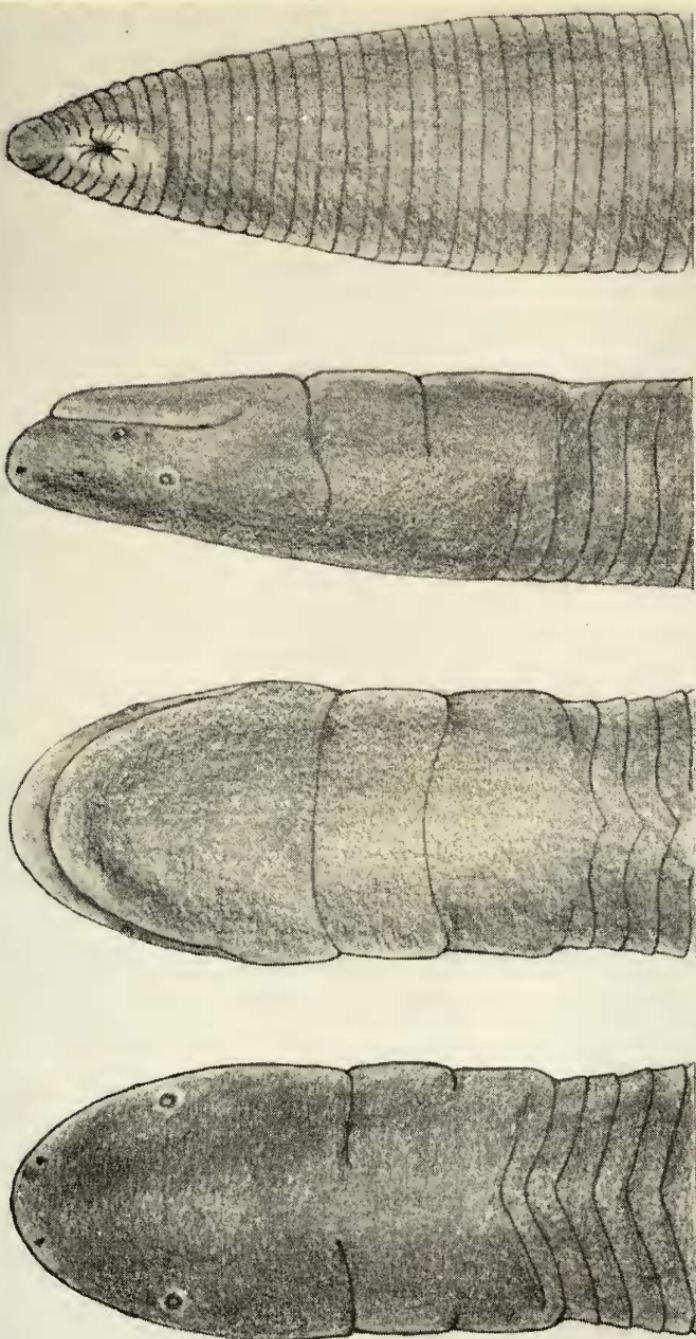


FIG. 18

FIG. 18. *Ichthyophis weberi* Taylor. Neotype. Stanford University No. 21758, near Iwahig, Palawan, P.I. A, B, C, three views of head; D, terminal part of body and subcaudal region. (Actual width of head, 8.5 mm.)

The folds following second collar, 304 (ventral count), 313 (dorsolateral count); folds immediately following the second collar, incomplete below, but complete dorsally; on middle third of body folds incomplete or dim on middle of dorsum; on latter third both folds and grooves more or less distinct, definitely so on posterior part. All folds, except a number preceding vent, form a well-defined ventral angle; tail very short, six folds present, four or five interrupted below by vent; sides of vent with eight or nine denticulations; an anal gland on either side of the vent, slightly elevated.

Scales begin immediately following the collars, one or two rows being present, the largest scales reaching a length of half a millimeter, the smaller ones 0.1 to 0.2 mm.; at middle of body three rows of larger scales present; on posterior fifth there are three or four rows (the fourth row not necessarily complete) and usually the scales not contiguous or overlapping, but generally large.

Dentition: Maxillary-premaxillary teeth, 25-25, small, of nearly equal size; vomeropalatine, 27-27, slightly smaller; dentary, 22-22, the last six to eight of the series a little larger than all the other teeth; no trace of splenials. Palate high, the choanae rather large, subtriangular directed outward and forward, the distance between them more than two and one-half times width of a choana. Tongue large, flat anteriorly, covering entire surface between the dentary series.

Color: Above nearly uniform violet to lilac; on ventral surface lighter with a suggestion of brownish; a whitish mark on vent. Tip of snout vaguely lighter; no spot at eye or tentacle; lower jaw not or but vaguely lighter than chin.

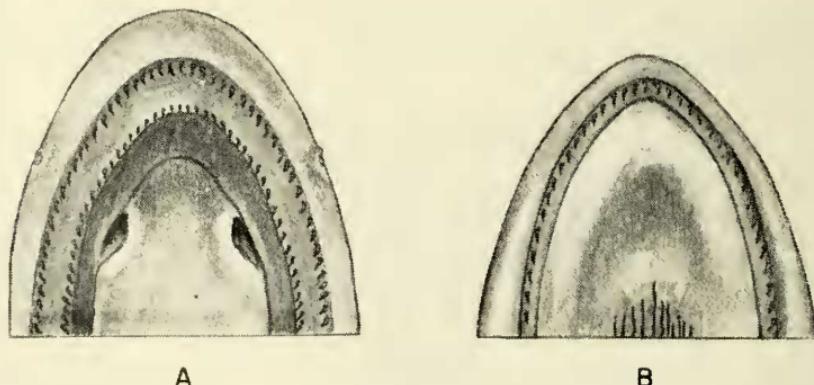


FIG. 19

FIG. 19. *Ichthyophis weberi* Taylor. Neotype. Stanford University Museum No. 21758, near Iwahig, Palawan, P.I. A, upper jaw and palatal region; B, lower jaw and tongue. (Width of head, 8.5 mm.)

Measurements (see table):

TABLE 3. Table of measurements and data on *I. weberi*.

Number	21758 ♂ *	21760 ♀	21762 ♂ *	21764	21759 Larva	Type
Total length	256	226	230	209	148.5	250
Tail length	4	3.1	3.1	3.3	4.5	2.5
Width of body	10	9.1	7.5	7.6	6.8	...
Width of head	8.5	8	8.6	7.8	7	...
Length of head to 1st groove	10	9.6	10.2	9.7	6	...
Eye to eye	5.8	4.8	5.4	5.25	4	...
Eye level to snout tip	4.9	4.4	4.8	4.9	2.3	5
Tentacle to eye	1.8	1.35	1.35	1.28	in eye spot	1.5
Tentacle to nostril	3.2	2.75	3.1	2.8
Snout to 1st groove	10	9.6	10.2	9.7	6	...
Snout to 2nd groove	13.7	12.8	12.8	11.3	7.3	...
Snout to 3rd groove	17	16.4	16.3	15.2	10	...
Total folds:						
dorsolateral	304	332	312	316	320	324
ventral	313	327	324	321	329	...
Tail folds	6	6	6	6	6	...
Maxillary-premaxillary teeth ..	25-25	25-25	25-26	24-25	15-14	...
Vomeropalatine	27-27	24-24	25-25	23-24	15-15	...
Dentary	22-22	18-18	21-22	21-21	13-13	...
Splenial	0-0	0-0	0-0	0-0	5-5	0-0
Vertebrae	107	108	105	105	105	...

* Numerous small ventral papules present on folds, preceding vent.

Variation: There are a few differences between the type and the neotype. The ventral groove mentioned in the type is probably due to preservation. Only the larva, No. 21759, shows a similar groove, obviously caused by preservation. The length of the tail of the type was said to be 2.5 mm. I suspect this measurement was made from the posterior rather than the anterior end of the vent. The color (above "yellowish brown") was probably due to changes brought about by fixation. The individual glandules that appeared in the type as "minute rounded yellowish dots" were doubtless made apparent by a slight surface dehydration. In the specimen reported here, the rounded glandules are dimly visible under magnification and larger elongate glandules are dimly visible bordering the grooves.

It would appear that the splenials are present in some larvae and that these are lost during transformation, as occurs in salamanders. One recently transformed specimen of the series, No. 21761, still shows two of the splenials still present. These I presume would soon have been lost. All others of the series of ten (except a larva) show a complete absence of splenials. The specimen with the highest number of teeth (No. 21766 ♀ measuring 258 mm. in length) is the largest of the series, the formula being, 28-28, 26-27, 28-28, 0-0.

The extruded tentacle is flattened, rather than conical.

Remarks: The coloration of the larva is darker above than that of the two largest specimens listed but scarcely darker than the two medium-sized ones. These are slaty violet dorsally and somewhat darker above than the neotype; the ventral coloration however is very similar. All the specimens have the head bent down at an angle. Whether this is a result of fixation, I cannot say.

Ichthyophis orthoplicatus sp. nov.

Figs. 20, 21.

Holotype: Zoological Survey of India, Calcutta, No. 17010, Pattipola, Central Province, Ceylon; F. H. Gravely, collector,* Aug. 2, 1915.

Diagnosis: A short, relatively broad species, the width in length approximately 19 times; unicolor lilac-slate, lacking any trace of a lateral stripe. Total folds on body and tail posterior to the collars, 291 to 295, seven confined to tail. *Grooves and folds not angulate on venter*; splenial teeth, 10-10; eye visible in a socket; tentacle a little more than twice as close to eye as to nostril; no diastema between squamosal and parietal bones.

Description of the type: Head oval, the distance between eyes (straight line), 5.5 mm.; from eye-level to tip of snout, 4.7 mm.; distance of tentacle from eye, 1.25 mm.; from nostril, 2.9 mm.; tentacular opening a horseshoe-shaped groove, separated from the edge of lip by a distance of 0.55 mm.; nostrils visible from above; first collar vaguely indicated laterally but the first and second grooves cannot be discerned above or below (probably visible in well-preserved specimens); third groove limiting the second collar not or scarcely discernible (probably because of the dehydration of the specimen); evidence of lateral longitudinal swellings on each side of the combined collars; seemingly there is one or more folds (grooves) on the dorsal posterior part of second collar. Total number of folds behind collars varies from about 291 to 295, of which six (or five) are confined to tail. Latter somewhat compressed laterally, flattened below, terminating in a point; anterior ventral folds incomplete for one fifth of body length; elsewhere folds and grooves above and below pass almost directly across dorsum and venter, no folds showing ventral angles. Vent longitudinal, the edges denticulate, interrupting three or four folds.

Dentition: Maxillary-premaxillary teeth, 23-22; prevomeropalatine, 20-20, smaller than preceding; dentary, 20-20, somewhat larger than the maxillary; splenial, 9 (or 10)-10, some equaling dentaries in size. Tongue rounded anteriorly not covering splenial teeth; choanae rather large, the diameter of one in distance between them, about three times.

* *Ichthyophis monochrous* (part.) Deraniyagala, Ceylon J. Sci. (B), vol. 17, pt. 3 (May 19, 1933).

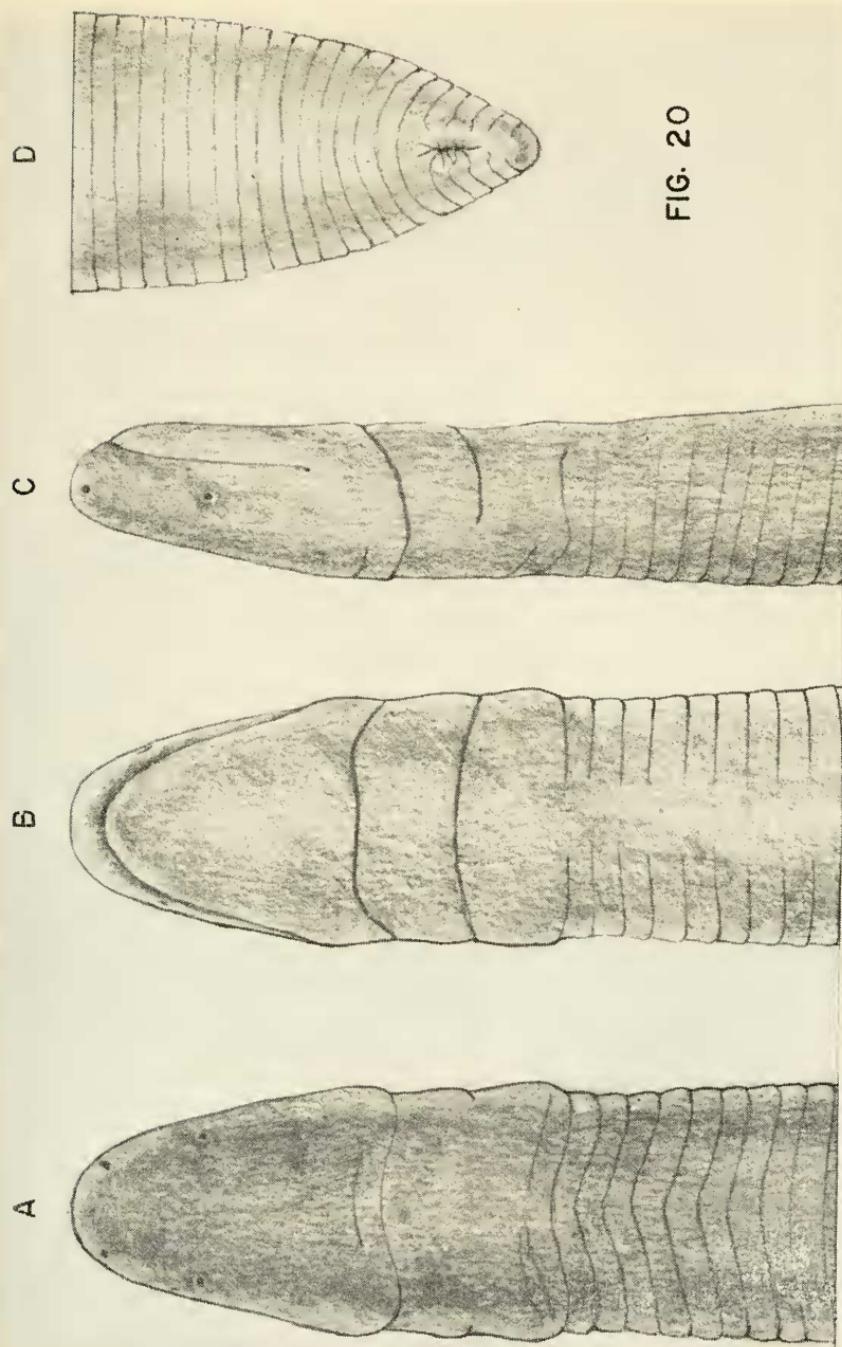


FIG. 20. *Ichthyophis orthoplicatus* sp. nov. Type. Zoological Survey of India, Calcutta No. 17010, Pattipola, Ceylon. A, B, C, three views of head; D, terminal part of body and subcaudal area. (Actual width of head, 7.9 mm.)

Color: Above and below lilac-slate (more brownish where dried), and seemingly not lighter on ventral surface; a very dim lighter ring about eye, and scarcely discernible lighter areas about tentacle and nostril; a light spot at vent, but no anal glands visible. Head somewhat olive above.

Measurements in mm.: Present shrunken length about 222 (estimated true length 235); tail length, 4; head width, 7.9; approximate body width, 12.5; width in length (approx.) 18 times.

Remarks: The type specimen is strongly contracted, the vertebrae forming a strongly sinuous line.

Rhinatrema, a South American genus of caecilians, which likewise has a species with a lateral stripe, differs from *Ichthyophis* in having all grooves and folds passing directly around the body. As far as I know, the present species is the only species of *Ichthyophis* known in which the folds (and grooves) fail to form a ventral angle throughout most of the body. However, for a greater or lesser distance preceding the vent (one fourth or less of the length) the folds and grooves of all species of *Ichthyophis* pass straight across the venter.

Deraniyagala, Ceylon J. Sci. (B), vol. 17, pt. 3, May 19, 1933, writes of the type specimen:

"*Ichthyophis monochrous*. This is the only specimen in the Colombo museum and has 298 annuli."

The few differences between Mr. Deraniyagala's description and that given here are insignificant. His count of folds perhaps includes the two anterior collars.

Kelaart (Prodromus Faunae Zeylanicae, 1852), mentions a mutilated *Ichthyophis* from Kandy "of a brown color above and a pale yellow brown

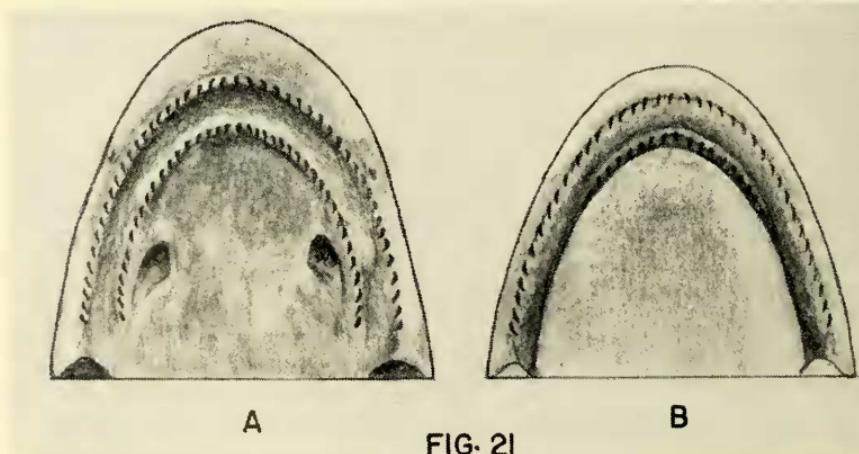


FIG. 21. *Ichthyophis orthoplicatus* sp. nov. Type. Zoological Survey of India, Calcutta, No. 17010, Pattipola, Ceylon. A, upper jaw and palate of mouth; B, lower jaw and tongue. (Actual width of head, 7.9 mm.)

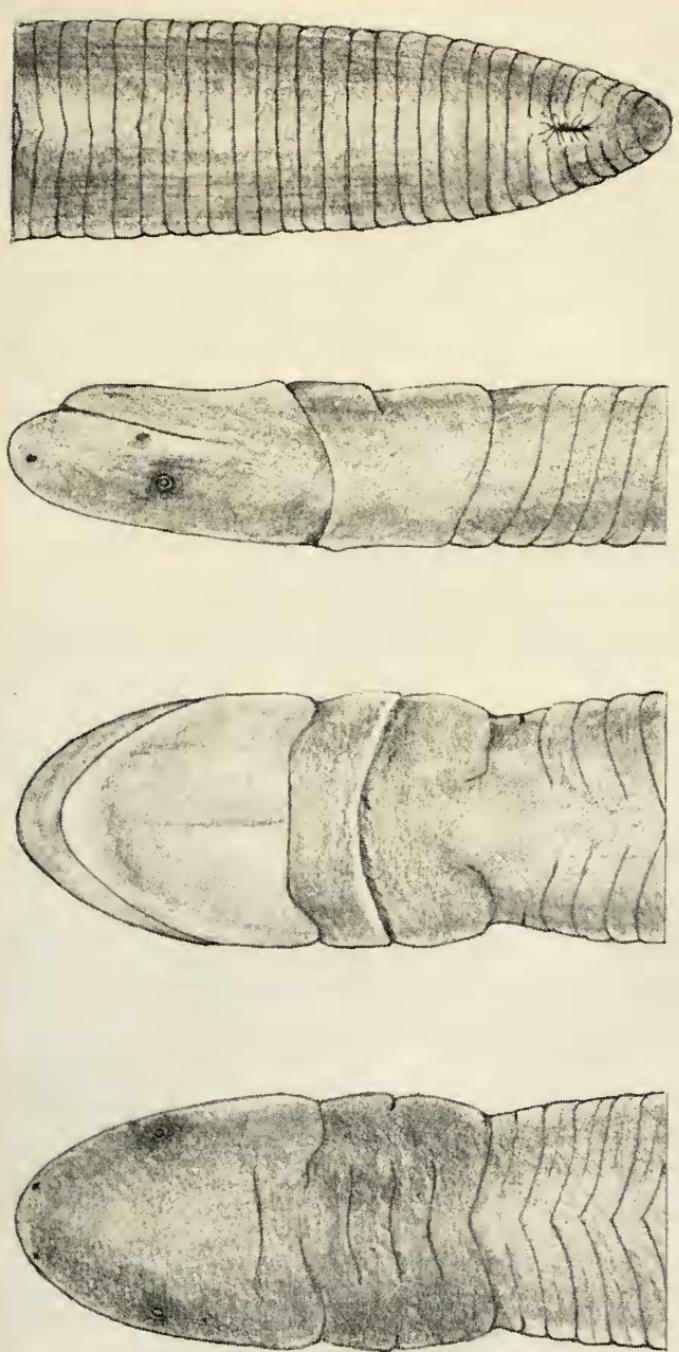


FIG. 22

Fig. 22. *Ichthyophis billitonensis* sp. nov. Type. Amsterdam Museum No. 5209, Billitan Island, Java Sea. A, B, C, three views of head; D, terminal part of body and subcaudal area. (Actual width of head, 5.8 mm.)

beneath, without the side streak of *Ichthyophis glutinosus*." He also states that Dr. Templeton found a new species in the island. These specimens are probably no longer in existence.

The species is named *orthoplicatus*, from Greek *orthos*=straight, plus Latin, *plicatus*, fold.

Ichthyophis billitonensis sp. nov.

Figs. 22, 23.

Holotype: Zoölogisch Museum, Amsterdam, No. 5209, Billiton Island, Indo-Australian Archipelago.

Diagnosis: Probably a small species (type 135 mm.). Total transverse folds, 251-254, five on tail, angulate on venter except on last fifth of body and tail; dorsally sinuous, a few slightly angulate anteriorly, others curving forward somewhat; posteriorly folds pass directly around body; eye distinct; tentacle nearly twice as close to eye as to nostril; splenial teeth, 1-1, relatively large. Collars distinct ventrally, fused dorsally; second nuchal groove below preceded by a narrow curved white fold (groove); scales relatively large, about three rows in each posterior fold.

Description of type: Head bluntly conical, the gape short; area above jaw-angles somewhat thickened; eye very distinct, probably functional; tentacle much closer to eye (1 mm.) than to nostril (2 mm.); eye to nostril, 2.7 mm.; tentacle from edge of lip, 0.25 mm.; nostrils visible from above, directed upward. First collar distinct below, fused to second collar above; first and second transverse grooves very distinct below, the second tending to form a slight fold which is curved, and white in color; dorsally first nuchal groove is interrupted for three and one-half millimeters; second barely discernible on sides when seen from above; third groove sharply marked dorsally, while ventrally it is indistinct; second collar fused posteriorly with the median ventral parts of two or three transverse folds; the collars, fused dorsally, have two longitudinal swellings separated mesially by a median longitudinal elevation.

Following the collars, there are 251-254 transverse primary and secondary folds complete around the body, except first three or four anterior folds on ventral surface; five or six folds confined to tail, two or three of which are behind vent. Tongue somewhat oval, anterior part normally covering splenials which are slightly exposed above gums.

Dentition: Maxillary-premaxillary teeth, 21-21; prevomeropalatine, 17-18; mandibular, 18-17; splenial, 1-1. Choanae large with somewhat elevated rims directed forward and laterally, the distance between them 1.4 mm., the transverse diameter of one (0.43 mm.), in this distance about three times; moderately large scales appear in first fold; at middle of body scales in two large and one small incomplete row; posteriorly there are three large rows and a few scattered smaller scales in each fold.

Color: Generally brown; head rather olive-brown, the collars dark brown; body above brown, the ventral regions a lighter brown; a light spot at vent, tentacle and nostril. A minute lighter ring surrounds eye; an indistinct lighter area above jaw-angle. At the present time there is indication of a yellowish line around each fold, probably due to a slight dehydration, thus causing the edges of the scales to be visible (not impossibly visible in life).

Measurements in mm.: Total length, 135; tail, 2.3; width of body, 6.7; width of head, 5.8; snout to first groove, laterally, 7; to second groove, 9.2; to third groove, 11; eye to eye, 3.3; eye level to tip of snout, 3; width in length, 20 times.

Remarks: Despite the small size of this specimen it gives evidence, in the distinctness of the folds and the development of the teeth and scales, of maturity.

The absence of a lateral stripe suggests a relationship with the *monochrous* group but in many ways it resembles the *glutinosus* forms. The retention of only two splenial teeth is unusual in this genus.

The species is named for its place of origin, the island of Billiton situated in the northern part of the Java Sea, between Sumatra, Borneo, and Java. Sometimes this name is spelled Belitung.

*Schistometopum epheli** sp. nov.

Figs. 24, 25, 26.

Type: Museo Civico di Storia Naturale, "G. Doria," Genova, No. 8773; Agua Ize (400-700M.) Ihla São Thomé, Gulf of Guinea.

Paratype: B.M. 1933.11.16. 1-4 ♀ Ihla São Thomé.

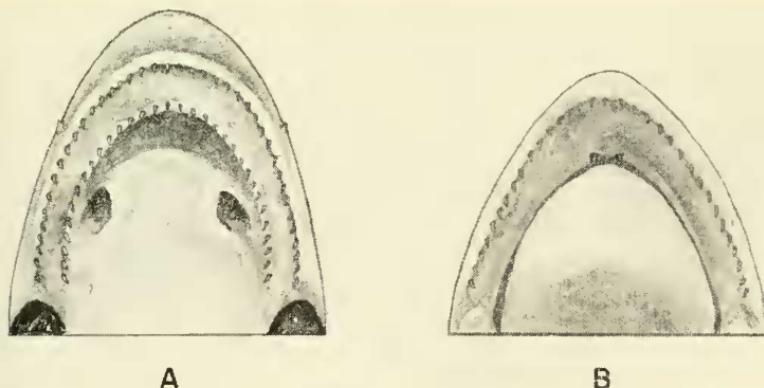


FIG. 23

FIG. 23. *Ichthyophis billitonensis* sp. nov. Type. Amsterdam Museum No. 5209, Billiton Island, Java Sea. A, upper jaw and palate; B, lower jaw and tongue. (Actual width of head, 5.8 mm.)

* From Latin *ephelis*=freckled.

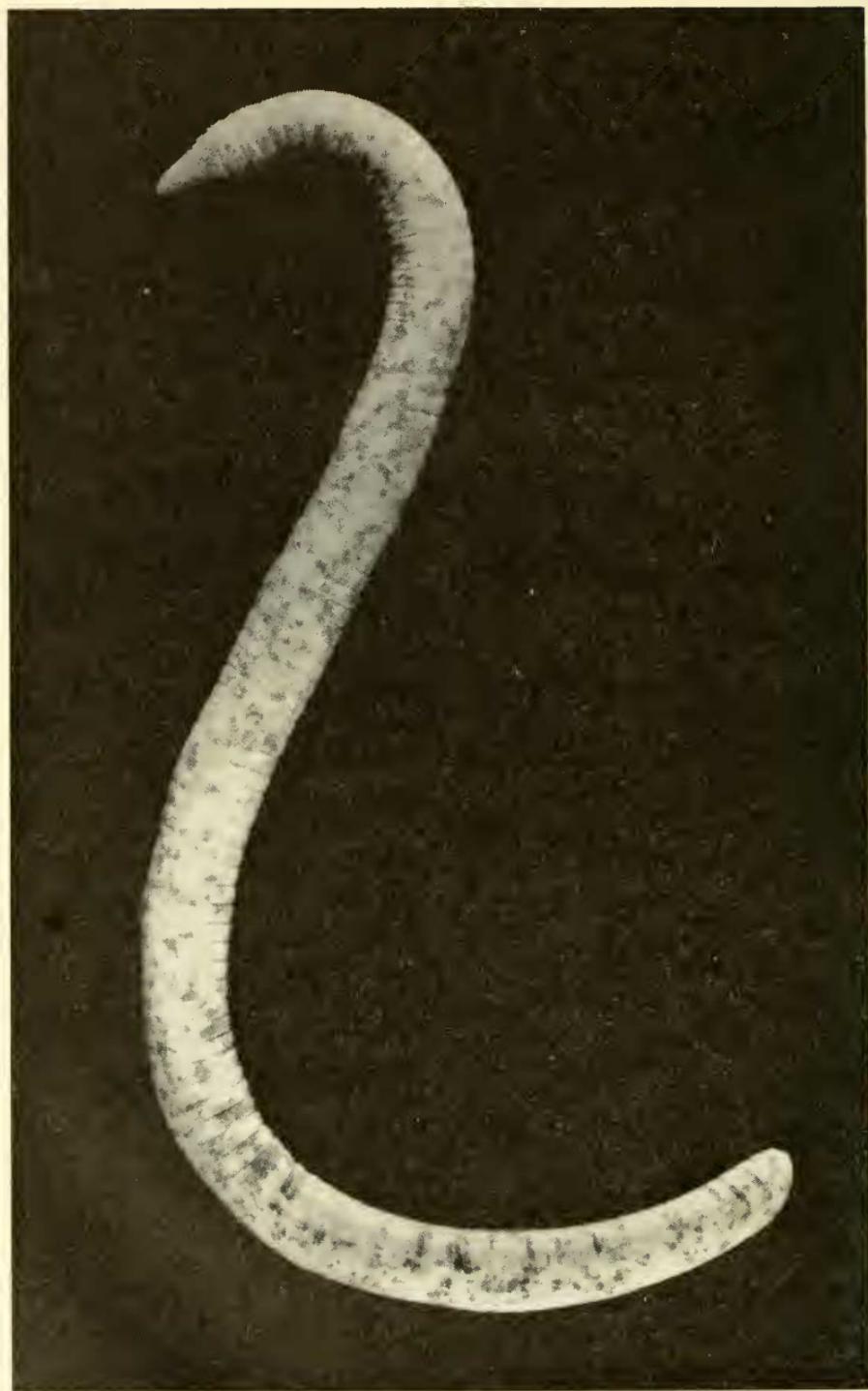


FIG. 24. *Schistometopum ephele* sp. nov. Type. Museo Civico Genova No. 8773, Agua Ize, São Thomé, Gulf of Guinea. Photograph of type about natural size.

Diagnosis: A *Schistometopum* with a proportionally smaller, more-pointed head than *thomense*. Color light yellowish-brown with dark lilac-brown flecks over dorsum and sides of body; fewer flecks on venter chin and throat; primary folds, 97-106; secondary, 40-52.

Description of the type: Head relatively very small; eye small, distinct in socket; distance between eyes (3.1 mm.), equal to length of snout in front of eyes (3.1 mm.); tentacular aperture small, separated from eye by 0.6 mm.; from nostril by 2.5 mm.; from mouth by 0.35 mm.; eye from nostril, 3.2 mm.; nostrils barely visible from directly above, practically terminal. Two collars; first collar sharply defined by a deep groove fore and aft surrounding neck, curving very slightly forward both dorsally and ventrally; a short indefinite transverse groove visible above and below; a distinct fold across chin preceding first groove; second collar a little wider ventrally than dorsally, with a distinct transverse groove above as long as width of body, not present ventrally; third groove, limiting collar, complete. Primary folds 97, all complete above and below, the grooves likewise distinct; secondaries, 40; total folds, 137; at first the grooves marking the secondaries are short; eight are complete.

Scales present, one or two appearing low on sides at about the 33rd fold; a single row complete around body where secondaries begin. In posterior portion where secondaries are complete, three scalarows present.

Dentition: Maxillary-premaxillary teeth 16-16; vomeropalatine, 18-18; dentary, 11-11; splenial, 10-9; dentary teeth longest, all directed backwards somewhat; splenials elevated to nearly same level as dentaries. Tongue not covering splenials, and lacking lateral beadlike elevations and grooves.

Color: Light yellowish brown with lilac-brown flecks and marks.

Measurements in mm. (type and paratype): Total length, 186, 340; width of head at first groove, 6, 9.4; width of body (middle), 9.2, 15.5; tip of snout to first nuchal groove, 7.2, 11; to second groove, 9.2, 13; to third groove, 12, 17; width near terminus of body, 6.9, 13.

Variation: The dental formula of the paratype is approximately 16-15; 18-18; 9-9; 8-9. There are 100 primary folds and 36 secondary; there is a slight lateral dorsal swelling (muscular) on each side of the head preceding the first groove. This is discernible also in the type. The snout projects very slightly beyond mouth. The vent is transverse, denticulated, but no anal glands are in evidence.

Distribution: Known only on Ihla São Thomé.

Remarks: This type was collected by the Leonardo Fea Expedition. In the British Museum one specimen is designated a paratype. This is a large specimen but considerably desiccated. A second specimen bearing the same number may likewise belong here (348 mm. long and dissected partially). Two other specimens under this number are completely yellow and are referred to *S. thomense*.

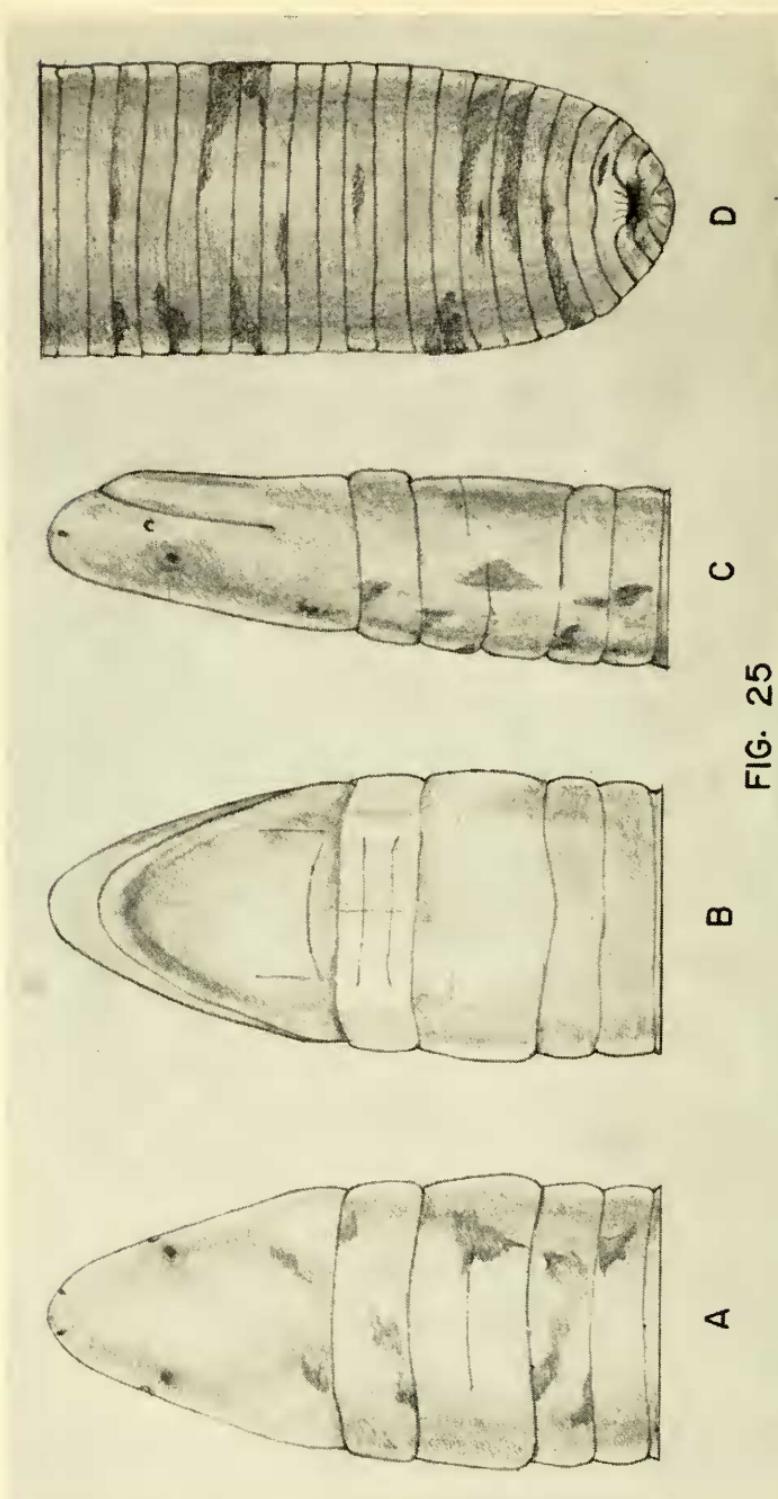


FIG. 25. *Schistometopum ephele* sp. nov. Type. São Thomé Island, Gulf of Guinea. A, B, C, three views of head; D, terminal part of head, ventral view. (Actual width of head, 6 mm.)

B.M. Museum, No. 1927.2.10.1 from the same locality may also belong with this species.

Schistometopum brevirostris Peters

Figs. 27, 28.

Siphonops brevirostris Peters, Monatsb. Akad. Wiss., Berlin, 1874, pp. 617-618, pl. 1, fig. 2 (type-locality, Westküste, Africa. Later reported by Peters as "aus Guinea"; Gorham, 1962, gives Rolas Is., Gulf of Guinea, but I have overlooked the source of this information).

Dermophis brevirostris, Peters, Monatsb. Akad. Wiss. Berlin, 1879, p. 937 (aus Guinea); *ibid.*, 1880, p. 223 (*Dermophis brevirostris* gleich *Siphonops thomensis* Bocage).

Diagnosis: Head elongated somewhat; diameter of body in total length 35 times. Color bluish gray, the grooves lighter; splenial teeth, 4-5.

Description of species: (from Museo Civico di Storia Naturale "G. Doria," Genova, Italy, No. 28881, from São Thomé): Body moderately slender and seemingly flattened somewhat throughout (rather than cylindrical); head slender, oval; the eyes distinct, minute, the distance between them equal to the length of snout from level of eye; snout extends beyond mouth, 0.6 mm.; tentacular aperture about one third diameter of eye, its distance from eye, 0.78, from nostril, 3.35; from lip, 0.5 millimeters. Two distinct collars; the first nuchal groove curves forward dorsally passing under chin in advance of the dorsal portion, the width of the first collar greater ventrally; first collar with a short transverse medial groove above and below; second collar nearly same width above and below, also with a dorsal transverse

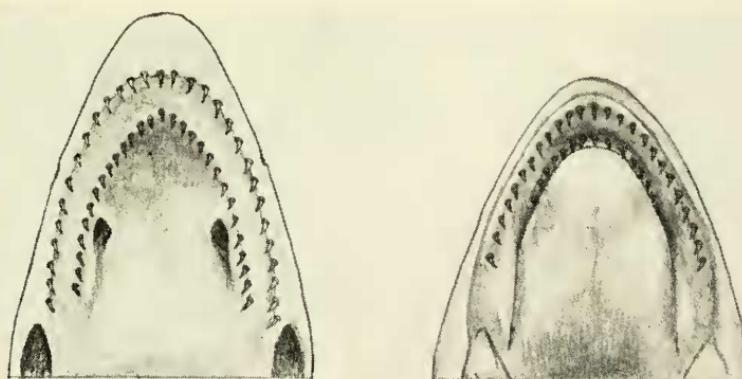


FIG. 26

FIG. 26. *Schistometopum ephele* sp. nov. Type. Museo Civico Genova No. 8773, São Thomé Island, Gulf of Guinea. A, upper jaw and palatal region; B, lower jaw and tongue. (Actual width of head, 6 mm.)

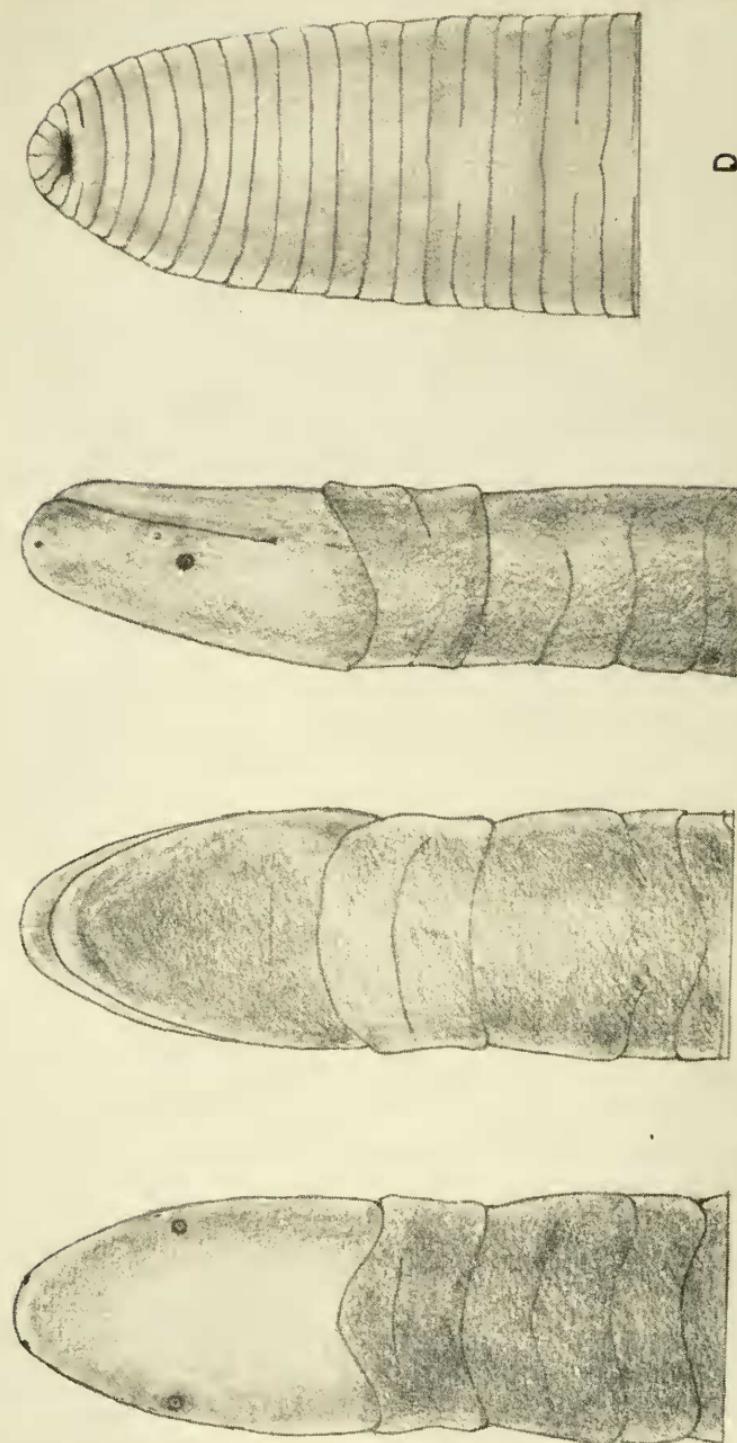


FIG. 27

B

A

C

D

Fig. 27. *Schistomectopum brevirostris* (Peters). Museo Civico Genova No. 28881, São Thomé Island, Gulf of Guinea. A, B, C, three views of head; D, terminus of body, ventral view. (Actual width of head, 6 mm.)

median groove but none on ventral part; the third nuchal groove incomplete below; second collar fused to the following first primary fold ventrally.

Total primary folds 101, complete above and below; secondaries, 38, the last nine complete; a pair of ventral longitudinal grooves beginning just in front of third transverse nuchal groove, cross the collars run forward on chin but fail to meet anteriorly; a small transverse ventral groove across back part of chin preceding the first nuchal groove.

Scales begin about the 20th fold, where one or two very small transversely widened scales are present; at middle of body a short lateral row present; at beginning of the secondaries a nearly complete row around body, the largest scales nearly one mm. in length; in each fold posteriorly there are four somewhat irregular rows, the largest scales a little more than 1.75 mm. in width; some are subcircular in shape. Skin glands not conspicuous, but in primary grooves a row of glandules usually evident, and at least posteriorly some very minute pores are evident under a lens. Terminus of body tapering, the vent transverse, its two sides denticulate, with a pair of small anal glands preceding it; from vent to terminus, 1.6 mm.

Dentition: Maxillary-premaxillary teeth, 15-16; prevomeropalatine, 20-20; dentary, 11-14; splenial, 9-9.

Color: In preservative, body light gray, becoming brownish anteriorly when removed some minutes from liquid. Head above and on sides nearly uniform cream to fawn, contrasting strongly with color on first collar; lower jaws light, the area between them gray brown; posterior part of body perhaps a little lighter than anterior.

Measurements in mm.: Total length, 236; width of body, 9.5; width of

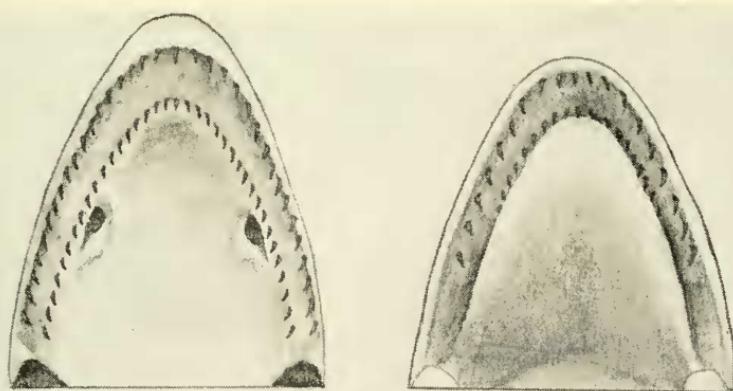


FIG. 28

FIG. 28. *Schistometopum brevirostris* (Peters). Museo Civico Genova No. 28881, São Thomé Island, Gulf of Guinea. A, upper jaw and palate; B, lower jaw and tongue. (Actual width of head, 6 mm.)

head at first nuchal groove, 6; tip of snout to 1st groove, 9; to second groove, 11.2; to third groove, 14.9; eye to eye, 3.85; eye-level to tip of snout, 4.1; body width in length, 24.8 times.

Variation: A specimen in the British Museum (No. 1927.2.10.1 from São Thomé) is somewhat darker gray than the specimen described and the grooves are somewhat lighter. The width in length (9.8 and 261 mm.) contained 26.6 times. There are 106 primary folds and 52 secondaries; the dental formula: m-p., 16-17; v.p., 19-18; d., 11-11; sp., 10-11.

Remarks: I would interpret Peters' counts, in my own terms of reference as: four folds for the two collars; followed by 132 primaries and secondaries of which the last 14 are complete; when the secondaries begin these folds are alternately incomplete and complete. Thus there are 96 primaries following the collars, and 36 secondaries.

I have referred these specimens to Peters' *S. brevirostris*, although I have not compared them with the type. Peters did not distinguish between primaries and secondaries, or between these and the two collars. The type, if still extant, was not available for examination in 1962.